THE

JOURNAL OF GAS LIGHTING,

WATER SUPPLY, & SANITARY IMPROVEMENT.

[REGISTERED AS A NEWSPAPER.]

VOL. XXIII. No. 579.] LONDON, JUNE 16, 1874. [26TH YEAR.] Price 6d.

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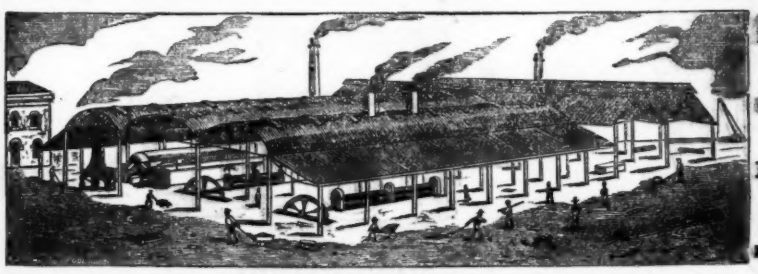

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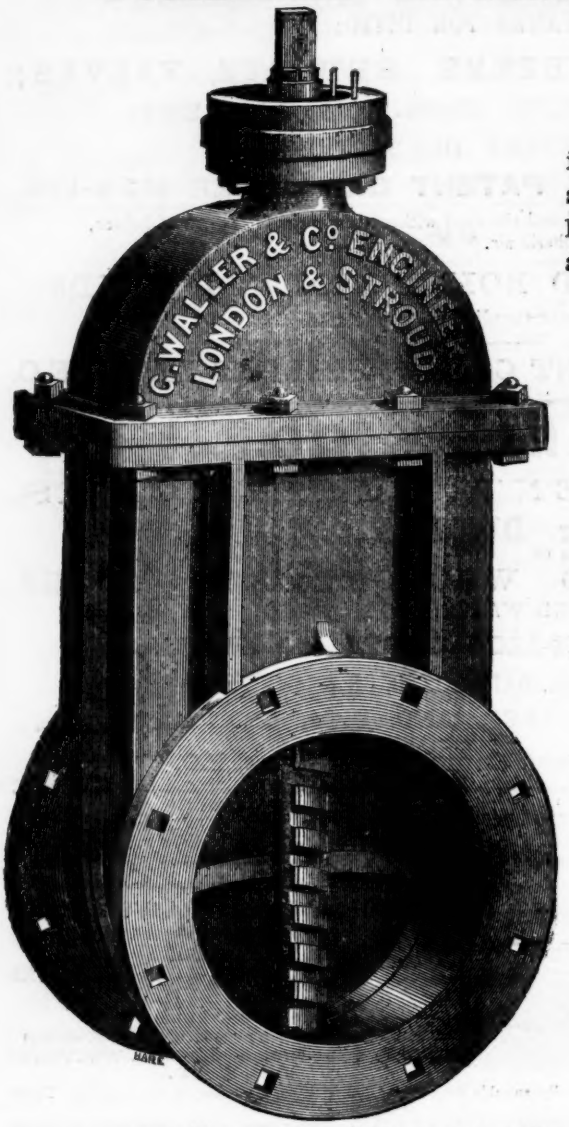
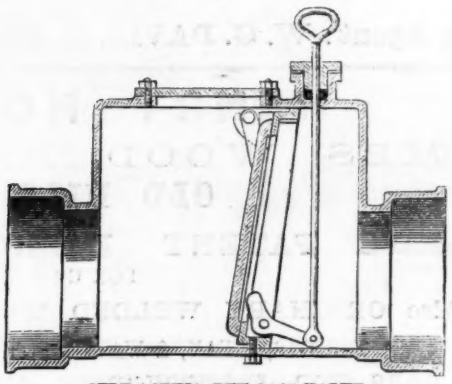
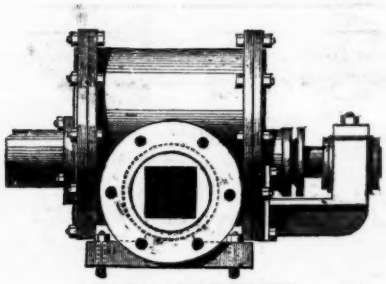


DOUBLE-FACED GAS-VALVE.

The Door has a wedged back, the Body is cast in one piece, and the Valves are proved on both sides to 30 lbs. per square inch. The Index has large studs to indicate how far the Valve is open, and they can be readily felt in the dark.



SELF-ACTING BYE-PASS VALVE.



BEALE'S EXHAUSTER.

PUMPS, VALVES (2 in. to 30 in.), HYDRAULIC REGULATORS, ENGINES, &c., in STOCK.

PHŒNIX ENGINEERING WORKS, HOLLAND STREET, SOUTHWARK, S.E.,

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STROUD, GLOUCESTERSHIRE.

1862.

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MADE ONLY BY

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This Paint having been in general use over twelve years (especially in some of the principal Gas-Works), and proved itself the best light-coloured Paint produced for resisting the influence of vitiated atmospheres, it is important that its qualities should be more widely known.

It is not discoloured like white lead in a sulphuretted atmosphere, nor washed off like white zinc; and its light colour reflecting heat, produces much less expansion of gas in holders painted with it than with dark colours, besides rendering them much more sightly. Its specific gravity is so much below white lead that the same weight will cover one-third more surface, while it is equal in body; and its price being about the same (30s. per cwt.), it is actually one-third cheaper. From experience, its manufacture is greatly improved, and it is quite suitable for all purposes in which white lead is employed.

Reference is kindly permitted by the Engineers of the City of London, Commercial, London, and Surrey Consumers Gas Companies, who pronounce it the best Paint known for their purposes.

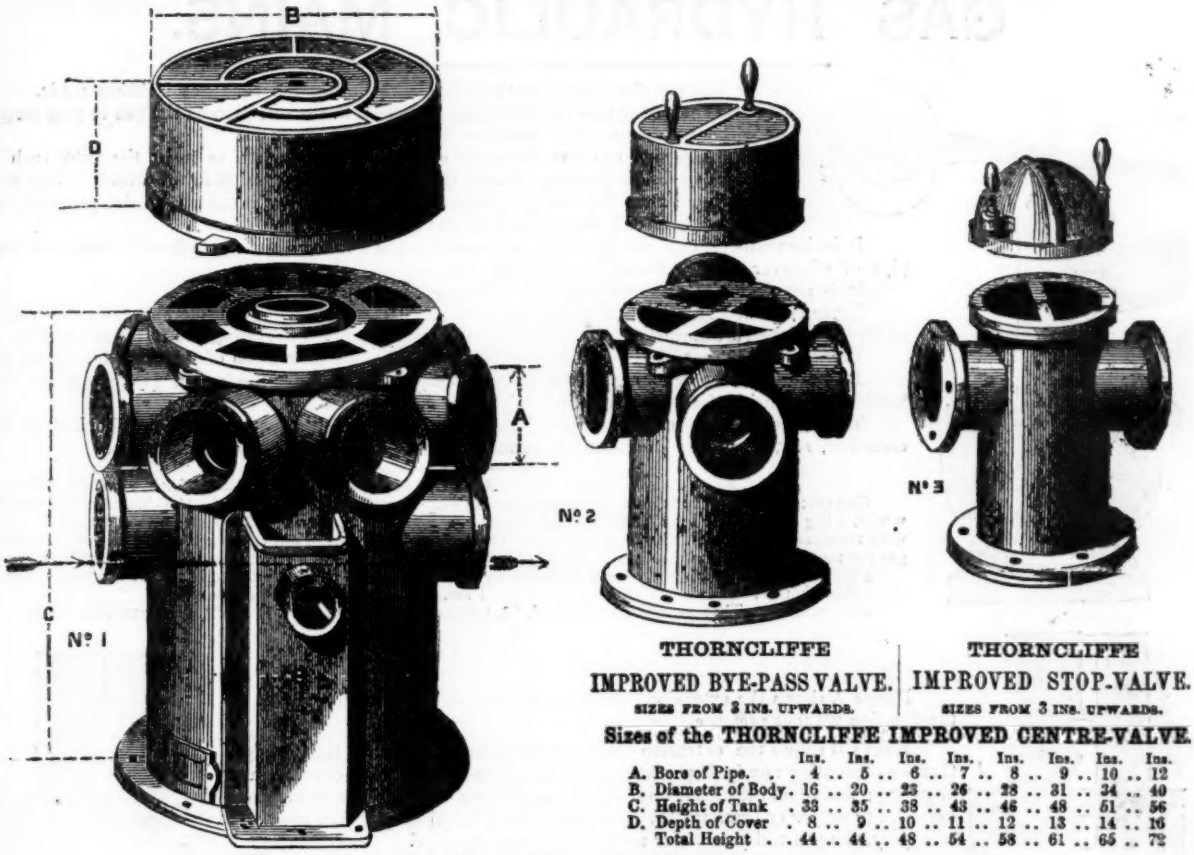
N.B.—Antimony Paint, COVERING SO MUCH MORE WORK, costs about 20s. per cwt., as compared with White Lead at 30s. per cwt.; a similar economy arises from its use in Steam and Gas Joints for which purpose it is superior to White Lead.

SPECIAL DRIERSFOR ANTIMONY PAINT SUPPLIED.

MESSRS. NEWTON, CHAMBERS, & CO.,

THORNCLIFFE IRON-WORKS, NEAR SHEFFIELD.

IMPROVED CENTRE-VALVES.



THORNCLIFFE IMPROVED BYE-PASS VALVE. SIZES FROM 3 INS. UPWARDS.

THORNCLIFFE IMPROVED STOP-VALVE. SIZES FROM 3 INS. UPWARDS.

Sizes of the THORNCLIFFE IMPROVED CENTRE-VALVE.

	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.
A. Bore of Pipe. . .	4 ..	5 ..	6 ..	7 ..	8 ..	9 ..	10 ..	12
B. Diameter of Body.	16 ..	20 ..	23 ..	26 ..	28 ..	31 ..	34 ..	40
C. Height of Tank .	33 ..	35 ..	38 ..	43 ..	46 ..	48 ..	51 ..	56
D. Depth of Cover .	8 ..	9 ..	10 ..	11 ..	12 ..	13 ..	14 ..	16
Total Height . .	44 ..	44 ..	48 ..	54 ..	58 ..	61 ..	65 ..	72

In all cases the Covers are cast heavy enough to resist any required pressure.

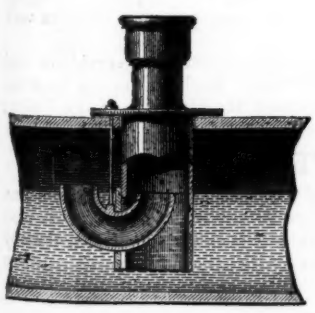
The advantages derived from the adoption of these Valves are so manifest and cardinal that in the immediate character of the change—the simplicity of the machine—the facility affording for cleaning out connexions between Valve and Purifier—the perfect collection and delivery by suitable overflow of the ammonia, at a greatly diminished depth from ground-line over the old form of Valve—the advantage of connecting on the same level, and at any angle, or opposite to each other, the inlet and outlet pipes without dip or rise—the clear acquisition of space in the purifying-house, by being able to place the boxes nearer together, the new Valve being entirely under the floor—and lastly, though of the greatest importance, the passage of crude and unpurified gas during the change is minimized to the merest fraction, thus preventing the fouling by impure gas the delicate machinery and easily affected exposed movements of the station-meter, thereby preventing the introduction of the enemy (unpurified gas) into the gasholder. Also a dead abutment is offered to all back pressure, imparting thereby to the gauges, governors, and hydraulic seals, a steadiness of action never realized with the once famous, but now fast becoming obsolete, Hydraulic Centre-Valve.

N., C., and Co. also Manufacture and Erect

PURIFIERS, CONDENSERS, SCRUBBERS, GASHOLDERS, ROOFS,

And every description of Gas Machinery.

TENDERS GIVEN FOR WORK FIXED COMPLETE IN ANY PART OF THE KINGDOM.



Messrs. N. C. & Co. are also the Sole Agents for

HAWKINS' PATENT SELF-ACTING DIP-PIPES.

These Patent Self-Acting Dip-Pipes are rapidly coming into general use by gas companies. By their use the whole of the pressure caused by the old kind of Dip-Pipes is entirely removed, therefore the yield of gas per ton of coal is considerably increased. They also act as a perfect safeguard against the deposit of carbon (or scurf) inside the retorts.

A saving of fuel is effected, and the wear and tear to the retorts greatly diminished.

They are also perfectly Self-Acting, they being regulated solely by the gas. They cannot get out of repair, and when once fixed, will last as long as the old kind, and can be easily adjusted should the hydraulic main sink; they can also be worked with advantage where there is no exhauster.

Testimonials can be had from Herbert Unwin, Esq., engineer of the Sheffield United Gaslight Company and the Penistone Gas Company. At both these companies works they have been in constant operation for several months. Further testimonials can be had on application to the Patentee, J. G. Hawkins, Effingham Street Gas-Works, Sheffield.

For Prices, &c., apply to

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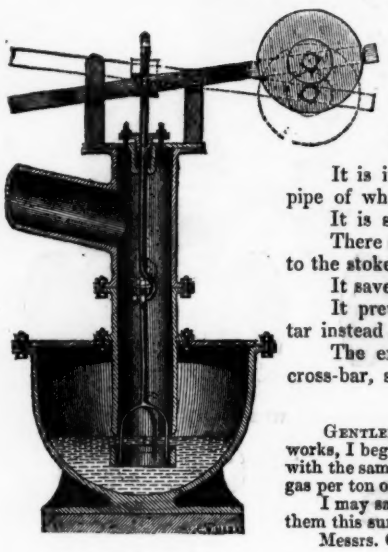
THORNCLIFFE IRON-WORKS, near SHEFFIELD.

CAFFALL, THOMAS, & CO., LIMITED.

PATENT IMPROVED SEAL

FOR

GAS HYDRAULIC MAINS.



It relieves the retorts from all pressure during the time gas is being made.

The end of the dip-pipe not being immersed in the tar, permits the gas to pass freely, and without pressure, from the retort into the hydraulic main.

The dip-pipe can be effectually sealed without trouble, to resist the back rush of gas, *to any possible pressure*, during the time of charging; but in the event of the Seal being left on, after the retort is closed, no inconvenience is caused, as the piece of pipe used as the Seal only lengthens it to an ordinary dip-pipe.

It is inexpensive, and can be easily and readily applied to any existing hydraulic main and dip-pipe of whatever shape or size, at a trifling cost.

It is simple in its arrangement, and cannot get out of order.

There is no deposit of carbon on the top of the retort, thereby saving considerable time and trouble to the stokers when drawing and charging, also the injury caused by scurfing the retort is avoided.

It saves 10 per cent. of the coal carbonized; also the same proportion of fuel, retorts, labour, &c.

It prevents the thickening of the tar in the hydraulic main, as the heated gas passes *over* the tar instead of being forced *through* it.

The extension piece of pipe is moved by a lever, from which hangs a ⅜-inch rod, hooked on the cross-bar, so that the lid of the retort cannot be struck without first sealing the pipe.

Alton Gas and Coke Company, Alton, Hants, April 25, 1874.

GENTLEMEN,—In reply to your inquiry respecting your Patent Dip for Hydraulic Gas-Mains in use at these works, I beg to say that, upon looking into our carbonizing account for the last 12 weeks, and comparing the result with the same quarters of the past five years, I find that your Dip has given our Company an increase of 1286 feet of gas per ton of coals beyond the make in the other years, notwithstanding the retorts have been in use for three years.

I may say that our Company are so satisfied with the Dips that it is intended to fit up the other retorts with them this summer.

I am, gentlemen, your obedient servant,

Messrs. Caffall, Thomas, and Co., Limited, 28, Gracechurch Street. WM. TRIMMING, Secretary.

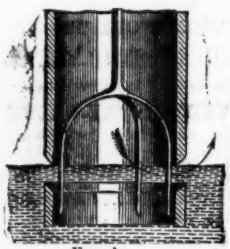


FIG. A.

Figure A shows the extension piece lowered to permit the gas to pass out of the dip-pipe without pressure.

Figure B shows the extension piece raised against the end of the dip-pipe, thereby preventing any back passage of the gas during the time of drawing and charging; and should it be left up while the gas is being made, no inconvenience is caused, *nor danger of bursting the retorts incurred; it being an open pipe and not a solid plug*, the gas will pass under as with the usual dip-pipe.

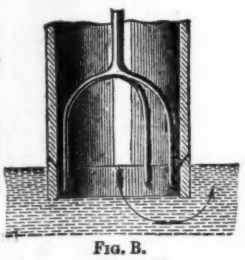


FIG. B.

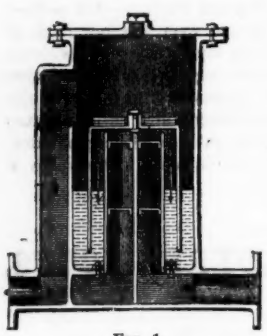


FIG. 1.

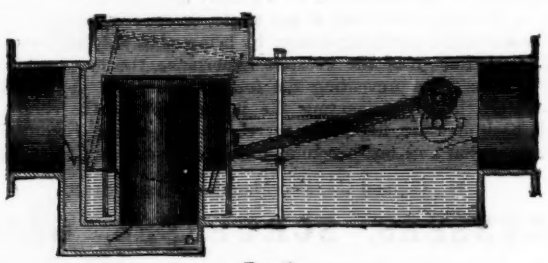


FIG 3.

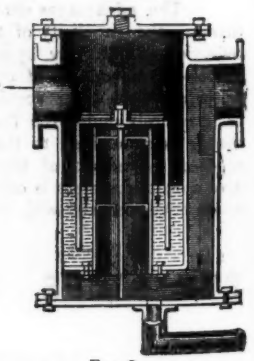


FIG. 2.

BYE-PASS FOR EXHAUSTER (Fig. 1).

This Hydraulic Bye-Pass has been invented for the purpose of supplying to gas companies a cheap, effective, and self-acting valve. It is simple in its construction, cannot get out of order, perfect in its action, can be made to stand any pressure, occupies very little space, and can be adapted to any existing pipes.

Fig. 2 is a Valve similar to Fig. 1, but made to act as a self-acting hydraulic bye-pass for washers, condensers, scrubbers, and meters; the Valve part being *below* the inlet and outlet, so that it may be applied to underground mains. Both Valves can be fitted to existing mains without disturbing them, more than the cutting out of a sufficient length to permit the fitting in of the Valve; after being properly fitted, they will require no further attention.

SELF-ACTING HYDRAULIC SAFETY-VALVE (Fig. 3),

For preventing the back flow of gas from the gasholder, and thereby preventing the possibility of accidents (the great damage and danger to life and property resulting therefrom) through the breaking of pipes, unsealing of purifiers, or any other cause. It is easy and prompt in its action, for upon the forward pressure of the gas ceasing, the bonnet *instantly* closes over the stand-pipe, thereby effectually preventing any return of the gas; no extra pressure is put upon any part of the works by its use, and it can be made to stand any required pressure.

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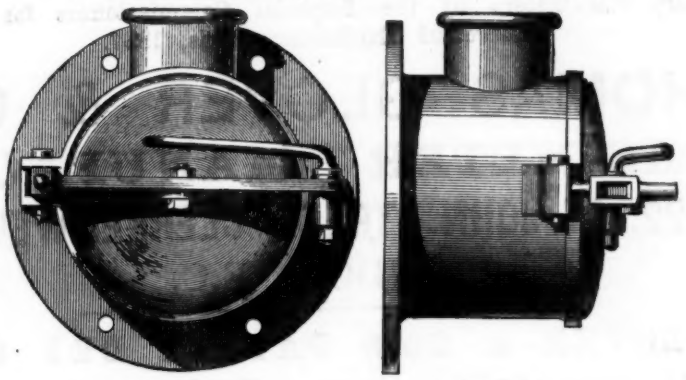

FRONT VIEW. SIDE VIEW.

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ECONOMICAL.

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EFFECTIVE.

NO DUPLICATE LIDS REQUIRED.

These Lids are proved by many eminent Gas Engineers to be the most efficient, saving much time, labour, and expense; are opened and closed as quickly and with as little trouble as an ordinary furnace door, and by their use the Retorts are soundly sealed during the whole period of carbonization.

These Lids are Adopted by the following (among many other) Gas Companies:—

The Gaslight Company, Beckton (where over 2000 are in use).
" Gaslight Company, Bow Common.
" London Gaslight Company.
" Independent Gaslight Company.
" Phœnix Gaslight Company.
" South Metropolitan Gaslight Co.
The West Ham Gas Company.
" Imperial Gaslight Company.
" Gas-Works, Arsenal, Woolwich.
" Commercial Gas Company.
" Alliance and Dublin Gas-Works.
" Edinburgh Gas-Works.
" Manchester Corporatn. Gas-Works.
The Salford Corporation Gas-Works.
" Rochdale Corporation Gas-Works.
" Liverpool United Gas-Works.
" Birkenhead Gas-Works.
" Birmingham Gas-Works.
" Nottingham Gas-Works.
" Newcastle-on-Tyne Gas-Works.
The Carmarthen Gas-Works.
" Merthyr Tydf. Gas-Works.
" Ystrad Gas-Works.
" St. Alban's Gas-Works.
" Over Darwen Gas-Works.
" Aylesbury Gas-Works.
" Cardiff Gas-Works.

The Morton's Lid is made circular in form, that being the most convenient and suitable shape. It can be used for Retorts of any section, by adapting the Mouthpiece casting from the D, oval, or other shape, at the back, to circular in front.

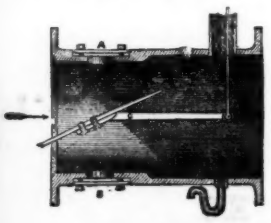
The following important Testimonial, among others, has been given:—

"*The Gaslight and Coke Company. Engineer's Office, 6, Westminster Chambers, Nov. 14, 1871.*

"Dear Sir,—In reply to your inquiry, I have the pleasure of stating that the whole of the Mouthpieces at Beckton have Morton's Lids attached to them and they have given us every satisfaction. We have 2160 in use.—I remain, yours truly, (Signed) "F. J. EVANS."

SOLE MAKERS OF

HUNT'S PATENT EQUILIBRIUM GAS GOVERNOR.



In this Governor a Throttle-Valve is substituted for the ordinary suspended Cone, all external communications being avoided by placing the Lever or Radius Arm (shown at C on the drawing) inside the Valve-Chamber upon the Disc. The Disc is carried upon steel centres, upon which it is accurately balanced and turns freely. The friction in working is thereby reduced to a minimum. This Governor is extremely sensitive to alterations of inlet or outlet pressure, and renders a large actuating holder unnecessary.

The principal advantages of this arrangement over the ordinary form of Governor are as follows:—

Its sensitive action prevents oscillation.

It is self-adjusting—*i.e.*, it maintains a steady pressure under variations of inlet pressure or a fluctuating consumption.

The inlet to Gasholder being contracted to the smallest possible dimensions, all danger from leakage through insufficiency of seal, tilting, &c., is entirely avoided.

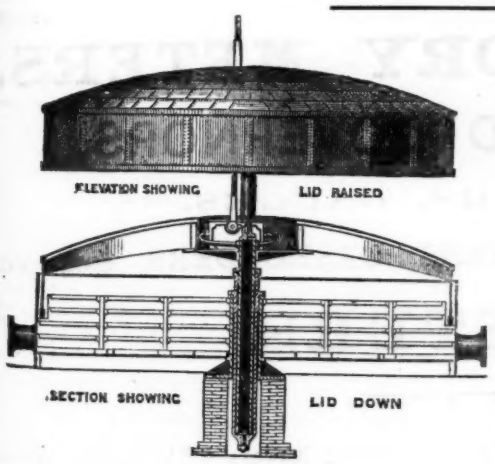
The valve portion being separate from the holder, it can be handled and fixed like an ordinary Slide Valve direct in the main; and the holder can be placed at any convenient distance immediately above it. The cost is thus materially reduced, and the inconvenience of heavy lifts done away with.

There are no working parts likely to get out of order.

These Governors have been adopted by several leading Gas Companies, among whom are the following:—

The Gaslight Company—a 24 in. at Whitechapel District Station.
" " a 36 in. at Goswell Road Station.
" " a 24 in. at " "
" " a 24 in. at the Gas-Works, Beckton.
The Gaslight Company—a 6 in. at the Gas-Works, Beckton.
The London Gas Company—an 18 in. at the Gas-Works, Nine Elms.
" " an 8 in. at " "
" " a 24 in. at " "

Also at the Gas-Works, Rochdale, Monmouth, Devonport, Cannes, and Mentone (France), &c.



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REQUIRES NO TRAVELLERS, CRANES, CHAINS, OR OTHER GEAR.

SAFE, SIMPLE, AND DURABLE.

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The latter being the Highest Medal awarded for Dry Gas-Meters by the Imperial Commissioners for the Universal Exhibition, Paris, 1867.

Paris, 1867.

THOMAS GLOVER & CO.,

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W. P. & Co. beg to state that they are now prepared to supply Station-Meters with planed joints.

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NOTICE TO SUBSCRIBERS.

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TO CORRESPONDENTS.

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THE JOURNAL OF GAS LIGHTING,

WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, JUNE 16, 1874.

Circular to Gas Companies.

THE British Association of Gas Managers have held a very successful meeting during the past week. The attendance was unusually good, a large number of new members were admitted to the Association, and the papers read, though fewer in number than usual, were of sterling value. It must be added that the festivities joined in, which are an essential feature of these gatherings, and render excellent service in promoting good fellowship among the members, were admirably conducted. We must then, once again, congratulate the members on the complete success they have realized in carrying out the objects for which the Association was founded. If a regret might be mentioned in connexion with a meeting so entirely satisfactory, it would be that the metropolitan gas engineers did not show a greater interest in the proceedings.

The able address of the president, which we publish to-day, left nothing to be desired. We may pass by the lucid account of recent inventions and processes connected with our manufacture contained in the address, and refer to one or two matters which suggest a word of comment. The first we would remark upon relates to the importance of the office of "gas manager," and the inadequate manner in which it is often remunerated. Strong as the observations of the president were, they did not at all overstate the case. There is no post within our knowledge to fulfil the duties of which satisfactorily necessitates the possession of such a varied amount of information and technical skill. The gas manager of to-day is expected to have combined in his own person the knowledge of an architect, an engineer, a chemist, a surveyor, with the skill of several mechanics, and often, when the office is combined with secretaryship, a little of the lawyer, and a good deal of the merchant. A man with such varied qualifications might reasonably expect to be liberally rewarded; but, as a rule, he is not; and the result, we do not hesitate to say, is detrimental to the true interest of gas companies. It should be the object of companies to encourage the fullest development of the talents required for an effective manager; and *they* can only do this by offering such a reward as will induce a man to devote time and study in preparation for his duties. The confession may be made without offence that the manufacture of gas is still mainly a rule-of-thumb business. The art has long passed the state of infancy, but it is far from perfected, and it may perhaps be described as now in the adolescent stage. We speak, of course, of the processes of manufacture and purification. In the probable future of our industry, dependent on much dearer coal, a more exact knowledge on many points will be desirable if not necessary, and the skill of the gas producer will be more and more taxed to satisfy at once the shareholder and the consumer. True progress can only follow upon accurate information, in the absence of which things put forward as improvements are simply guesses.

The remarks on the results of recent legislation towards the close of Mr. Livesey's address are, as he fairly said, liable to be misunderstood. His own company occupying an exceptionally favourable position, the observations of the President may be thought by some to look invidious, when we are certain that they were made in the best possible spirit. The rights of gas companies have no stouter champion than Mr. Livesey, but he has the courage to say that gas companies have duties; and if, at the moment, he seemed to fall in with popular clamour, it was only because, for his purpose, it could not be avoided. It is the common cry that the revision clauses of recent Acts have removed all incentives to economy—nay more, have encouraged extravagance. To say that waste and extravagance have actually resulted would be to bring a charge against certain companies which Mr. Livesey promptly repudiated, and which we make bold to assert could not be sustained. It often happens in individual life that a man who may be considered to have the fewest incentives to thrift is more prudent in his dealings than another whose every desire should be to economize. And so with companies. Mr. Livesey, however, was undoubtedly right in pointing out what must be the inevitable consequence of unnecessary capital expenditure. We do not agree with him in thinking that a gas company ought never to spend capital which will not be immediately remunerative. It is often the truest economy to anticipate wants; and, if we are not mistaken, the South Metropolitan have reaped the advantage of provident foresight. After these observations, we may thank Mr. Livesey for wise and thoughtful cautions which, when fairly pondered over, we are certain will commend themselves to the attention of gas companies.

The vestrymen of London assembled in force in St. Pancras last week, and tried to settle, in their own minds and to their own satisfaction, what is to be done with the gas companies. They broke up, however, without coming to any conclusion, and the companies will continue to exist. The object these gentlemen have in view is perfectly clear and intelligible, and, we may add, praiseworthy. They want to cheapen gas, and if they will show us how to achieve this result, while maintaining a due regard to the rights of property, we shall be very glad to give them our best assistance. No one of them, however, suggests anything but what practically amounts to confiscation, and this we are compelled to resist. We pass over the suggestion that every metropolitan parish should have gas-works of their own, because we are certain the idea would never be seriously entertained. If we suppose for a moment that legislative or departmental sanction—which we know would never be granted—were obtained for the raising and expenditure of capital necessary for the works, the competition of the companies would immediately render such works unproductive, and public lights would cost four or five times as much as they do now. A parish supply of private consumers is out of the question.

In what direction then, it may be asked, is the consumer to look for relief? We have at last a definite proposal. A deputation of South London consumers had, the other day, an interview with Sir Charles Adderley at the Board of Trade. It is in South London that the grievances of gas consumers are best illustrated. They can buy meat on either side of a road at the same price; but if they buy gas, it is otherwise—they must pay 3s. on one side, or 4s. 6d. on the other. To what, they very naturally ask, is this difference owing? and they are told that it is ascribable to the capital accounts of the two companies concerned, and to management. The deputation we refer to provided themselves with a professional spokesman who, according to a newspaper report, told the President of the Board of Trade a curious thing—namely, that gas lost half a candle in illuminating power for every mile of main it traversed. The point of his speech was to suggest that the gas referees should be empowered to deal with questions of

the expenditure of capital, and of price, at the requirement of consumers. It is quite clear that gas referees, as at present constituted, could not possibly deal with these questions, and it is probable that the speaker meant to suggest the formation of a permanent body of arbitrating commissioners. Two such bodies as those named, existing at one time, at the expense of the metropolitan gas companies, can hardly be desirable from a consumers point of view. Sir C. Adderley seems in favour of extending the functions of the referees, and half hints that this is the direction in which he will recommend Parliament to move. He clearly foresees, however, the difficulties he will have to encounter in persuading Parliament to interfere with any arrangements already sanctioned. Nor, indeed, it is fair to say, did the deputation ask for the disturbance of guaranteed rights. They wish the supply to remain with the companies, and they wish the companies to have their full dividends. What they appear to seek is to deprive the companies of the right to manage their own affairs. They would have a Government commission to "control" charges, and regulate the expenditure of capital. Now, if Parliament were to enact that the capital accounts of the companies should be deemed closed, and that for the future, instead of giving power to raise, at discretion, sufficient for ten or twelve years, the consent of a commission should be obtained for every extension of works and any addition to capital, some sort of control would be established. But we know that Parliament would never consent to this. If it were possible to make out a case of lavish expenditure against a company, a proposal of the kind might find some support. But all we hear from the opponents of the companies are reckless statements, the extravagance of which carries a refutation. For example, a speaker at the St. Pancras conference, the other day, alleged that the Imperial Company were erecting works which would not be required for ten or twenty years. Of course, he contented himself with the bare assertion, and brought forward no facts in support of the statement. It is by exaggerations like this that vestrymen defeat their own object. Let them, as tradesmen, calmly inquire into facts, and then settle in their own minds what they would do under the circumstances, if they had the management of the gas companies; and we have little doubt that they will, in the end, come to the conclusion that the directors are doing as well as possible for the consumers. It may be a matter of regret to some that we cannot use the sponge which Cobbett proposed to apply to the National Debt, but, at present, it is still admitted that capital has rights.

It is sincerely a matter of regret to us that we can at this moment see no prospect of cheap gas in the metropolis. If the coal market be favourable, some reductions may be anticipated next year; but we reluctantly express a confident opinion that gas will never return to former rates.

The space given to the introductory report of proceedings at the meetings of the Gas Managers during the past week, compels us to omit the 18th chapter of "The Treatise on Gas Lighting" until our next number.

WATER AND SANITARY NOTES.

The drought still continues, and increasing difficulty is felt in keeping up the supply of water in places dependent on rainfall. In some parts wells too are failing. River schemes, of course, hold out, but these may become a little affected in the autumn, when we have more rain. At Dundee the supply is now shut off from three p.m to six a.m., which reduces the supply to nine hours per day, and must cause great inconvenience. There is already a talk of running mills on short time in consequence of the scarcity. At Montrose the well is at times nearly dry, and an additional source of supply is urgently needed. We may mention here that it is denied in the Town Council of Wolverhampton that any deficiency of water exists in that borough. The chairman of the Water-Works Committee asserts that the supply is practically unlimited in quantity. We observe a scarcity recorded in several other localities; and much suffering may be anticipated as a consequence. Such paragraphs as the following are not uncommon in local papers:—

> Should the present weather continue, the wells, already so much weakened, may altogether fail, in which case a water famine must result. At Dronfield Woodhouse the wells have been dry for several weeks, and the inhabitants have in consequence to carry their water from a place more than a mile distant from the village. Unstone, the inhabitants of which now number upwards of 2500, having doubled in the short space of two years, is, if possible, still worse off, and typhoid fever has appeared in the locality.

As at Dronfield, the sinking of a new coal-pit often drains all the village wells. It has happened at Eckington, but there a company has been formed to utilize the water which flows into the pit shaft. The company has been called into existence by the fact of the sanitary authority of the union giving the parish notice that, unless something was done by the parishioners themselves, they should be compelled to take the matter up forthwith, and the parishioners fear lest the cost which might be thrown upon them should far exceed the cost they themselves could do the work for. As the water must be pumped out of the mine by the proprietors, the cost of pumping to the company will be reduced to very little, and Eckington being favourably situated for a supply by gravitation, the water-rates, we expect, will be low.

A new reservoir has been nearly completed for the Corporation of Bradford, but is not expected to be filled before next winter, if then. It is intended to supply the high level district in Bradford, where the inhabitants at present suffer a good deal from a scarcity of water.

The Neath Town Council are in great difficulties with respect to water supply. It would seem that they have recently only distributed a little muddy fluid—admitted to be "undrinkable," but declared not to be "impure"—and the surveyor assured the council that they would not get even that in another week. Under these circumstances he has been instructed to put the town pumps in order. It is curious to remark how rarely Town Councils are successful with water undertakings.

Having defeated a company before Parliament, the Town Council of Truro propose to do something to supply the place with water. They intend to sink a well, and when that has been done, they will have the water analyzed, and, if it should be found good in quality and sufficient in quantity, they will consider about distributing it. In the council it is admitted that they are pledged to no particular scheme, and might adopt a better one if it were offered. So the ratepayers may perhaps find that all the money sunk in digging the well has been wasted.

The Corporation of Doncaster are not quite unanimous against the Wakefield Water Bill; but there is a majority in favour of carrying on the opposition before the House of Lords. The opponents of the Bill, it must be admitted, are numerous and influential, and we fear the chances of its success are few.

We are happy to see that the local opposition to the Edinburgh and District Water Bill is now practically quashed. The Water Trustees have agreed to a resolution approving of the Bill as amended in committee, and we do hope we have now heard the last of what has been little better than disgraceful squabbling. It ought perhaps to be mentioned that the Leith representatives, who have been the loudest opponents, stayed away from the meeting which approved the Bill. Edinburgh is now in a fair way of getting an abundant supply of excellent water.

A curious sewage difficulty has arisen at Nuneaton. The Local Board have let the sewage to the General Sewage and Manure Company, who work Anderson's patent for precipitation by means of sulphate of alumina and lime. The company find the sewage very dilute, and they get but little out of it. Now, it appears that the largest contributors of water to the sewage are the Nuneaton Wool Company, and the Local Board have actually called upon the company to divert their waste water from the sewers. The company stand firmly on their right to use the sewers, and refer the Local Board to their solicitors, and so the matter at present rests, and is likely to rest, to the great disadvantage of the manure company.

The Native Guano Company, which has held a position very analogous to that once occupied by the Patent Gas Company, is likely to share a similar fate. A general meeting of the company is to be held on the 18th inst., to obtain from the shareholders, if possible, authority to raise further capital to the amount of £20,000; but it is understood there will, at the same time, be submitted a proposal to wind up the company. The "hope deferred" must, we fancy, have made the hearts of the shareholders sick, and we should be surprised to see the new capital raised. As in the case of the gas company, the loss of capital is as nothing compared with the heavy losses incurred by the wild speculation carried on in shares, on which, if we remember rightly, no dividend has ever been paid. The circular issued by the directors is a sad confession of a long series of disappointments, and it is admitted that there is no hope for the company but in the introduction of active sanitary measures by the Government. We fear this would not help them. If the faith, energy, and perseverance which, it must be admitted, have characterized the management of the company during all the five years of its existence, could avail them nothing, we fear their case is hopeless.

THE NATIVE GUANO COMPANY.

Prominent of all the schemes that have yet been brought forward for the treatment of sewage by chemical schemes, is that of the A. B. C. process, secured by several patents to the Native Guano Company. We have been recently favoured with a copy of the report which has been sent to the shareholders, in anticipation of the general meeting, which is to be held on Thursday next. In our issue of April 21, at page 545, we have given a full account of the process usually adopted by the company, and as carried out, with more or less success, at Leamington, Hastings,

Leeds, Bolton, and lastly at Crossness, in regard to the Metropolitan southern sewage.

We regret to say that the anticipations we have already expressed in regard to the unfortunate position of the Native Guano Company are verified by the report to which we now draw attention. In this it is stated that after anxious deliberation the board came to the conclusion that it would be for the interest of the shareholders to postpone the general meeting of the company, which would otherwise have been held in the autumn of last year, from month to month, on account of important and delicate negociations, which were in progress with foreign countries. These have, apparently, failed; and therefore the hopes that the necessity of asking the shareholders for an advance of more capital would have been avoided, have proved futile. It appears from the report that, "as the shareholders must have anticipated from "last year's accounts, the then remaining assets have (with all "the economy the board could practice) been gradually absorbed, "and the raising of further capital has become imperative." The largest shareholders having been consulted as to raising fresh capital to the extent of £20,000, four gentlemen were appointed to investigate the company's affairs, and a scheme is to be submitted next Thursday to the shareholders for their approval, for raising this fresh capital. The report enters into a lengthened account of the prospects of future success, and causes of past failure of the company's operations, into the particulars of which we do not for the present propose to enter, as they are subjects which require careful examination. The report in these respects contains certain statements with which, from an accurate knowledge of the facts, we entirely disagree, especially in regard to the trial of the A. B. C. process at Crossness, under the supervision of the officials of the Metropolitan Board of Works. There is evidently a confusion of the report of that body and of the Streets and Sewerage Committee of Leeds, in respect to the agricultural value of the native guano.

A very important point in the report is that in which the board states the "regret that they cannot report any progress during the "past year in the adoption of the process by the various town "authorities." This is a matter of no great surprise. When a company has spent four years, and £100,000, in trying to persuade Corporations, Local Boards, Royal Commissions, &c., that its process is superior to any other, and yet has to acknowledge an entire commercial failure in all its operations, the common sense of the community has only one resource—that of exercising its own judgment—and that, as unfavourable to the pretensions of the company, has simply resulted, not from any want of capability in regard to the process, but from utter mismanagement in the carrying out of the details.

In our next issue we intend giving full details in regard to the history, progress, and, at present, the apparent fall of the company. The surest sign of the latter aspect is the retirement of Mr. C. Rawson as the general manager. He has hitherto been the cement of a rotten structure, whose fall has long been expected by men of science and those engaged in financial matters.

SOCIÉTÉ TECHNIQUE DE L'INDUSTRIE DU GAZ EN FRANCE.

In a communication from our Paris correspondent some months ago, mention was made of an intention to form, at Paris, an institution similar to that of the British Association of Gas Managers and Engineers. This has become now an accomplished fact. Under the title of *Société Technique de l'Industrie du Gaz en France*, a society has been formed which has the following objects:—First, that of ventilating, by discussion and personal communication, subjects relating to gas manufacture; to encourage the study of the subject generally, and to publish works and discoveries relating to this branch of industry; secondly, to maintain communications in such a manner that there may be kept up a constant interchange of ideas among all the members of the society; and, thirdly, to assist, temporarily, within the limits of its resources, those of its members who may be under the necessity of claiming its aid. It is proposed to hold the first meeting of the society on Tuesday, June 23, at the Hall of the Society of Civil Engineers, 10, Cité Rougemont, at Paris, after which a sitting will be held for the reading of papers which have been sent in by the 15th inst. The preliminary list of members contains the names of 60 gentlemen, all directly or indirectly connected with the manufacture of gas. The secretary-treasurer is M. Albert Ellissen, 21, Rue Abbatucci. Three classes of members are proposed, without limit in regard to number—namely: Society, Associate Members, and Honorary Members. The condition of the first class of membership is that of being in direct connexion with gas-works in France, either as an engineer, manager, director, &c.; an associate may be any person having such an occupation as relates to the manufacture; and honorary membership is granted to persons whose labours have aided the progress of gas manufacture, but who are otherwise not eligible to be members or associates. Certain definite conditions are imposed in respect to the election of each class of members. Society members have to pay an admission fee of 10 francs, with an annual contribution of 20 francs; associates have to pay the same annual subscription, and an admission fee of 100 francs; but a composition of 250 francs renders either class of members free for life. Honorary members are exempt from both admission fees and annual subscription. The officials consist of a president, a vice-president, a treasurer, and two secretaries, with an administrative or executive committee composed of previous presidents, and twelve members elected at a general meeting, annually. But these officers must be chosen only out of society members. The annual meetings are to be held either in the months of April or May, a month's notice to be given in the case of either ordinary or extraordinary meetings. Various other rules are proposed, but all have yet to be finally settled at the first annual meeting, to be held on the 23rd inst. We congratulate our friends in France upon the inauguration of this important undertaking, and heartily wish for their society a corresponding amount of success to that realized by the British Association.

Correspondence.

OXIDE PURIFICATION.

Sir,—My attention has just been called to the numbers of your Journal for the 5th and 26th of May last, where, under a treatise on the manufacture of gas, most unfair and erroneous statements are made in relation to my patent of Nov., 1849, for the purification of gas by hydrated oxide of iron. They are much the same sort of interested one-sided statements as were got up at the various trials at law and equity through which I was dragged by the parties who endeavoured to upset this patent—namely, "That my invention was disclosed in old books;" "That Mr. Croll's use of oxide of iron was the same as mine;" "That a previous patent of Mr. Laming's covered my plan;" "That Mr. Evans was trying experiments with oxide of iron at Westminster, on a plan of Mr. Laming's, before the date of my patent, and, therefore, I was not entitled to it; "That Mr. Laming had a French patent which invalidated mine;" "That my patent was not for purifying gas, but for treating peat," &c., &c., &c. In fact, every endeavour that the most interested and perverse ingenuity could devise was resorted to on those trials, and which the remarks I complain of in your Journal to a great extent repeat, although they were all refuted and disproved by the clearest evidence and the most searching inquiry at those trials, extending over many years. If it were worth while, it could easily be shown that it was proved at those trials that I purified gas at the Deptford Gas-Works by the use and renovation of oxide of iron before, not after, the date of Mr. Laming's French patent, although, as far as renovation is concerned, I do not claim any merit for it, as it was published by Berzelius and other chemical books, and it was known to chemists long before that time, that sulphuret of iron became oxidized by exposure to the air, and the only question was whether there was anything in the gas to prevent it.

It could also be shown that I did not know of that patent until long after mine was specified, and I did not see the specification or know its contents until about a year and a half after the date of mine, when I got a copy of it, and found that the oxide was to be mixed with chloride of calcium, which, in my opinion, would render it practically useless, and would be a quite sufficient reason why the trials of this patent of Laming's at Westminster and elsewhere practically failed, as was proved at the said trials. But I do not think it worth while, at this time of day, to go into these matters again, as no short statement could make anything clear. The whole matter has been printed in a book of the trials, which any one interested in these matters may see. Suffice it to say that, when any of these matters were properly investigated by competent people, they were always decided in my favour, and my patent was sustained, and held good to the end, in spite of everything attempted against it; and if this does not show that I have been right, and my opponents wrong, I do not know what will; and, so far from my ever relinquishing my claims, or making any compromise of them, even Messrs. Laming and Co. themselves always paid me a royalty for the use of my patent. When I applied for an extension of it, there was no fine or proof that the patent was not mine, as stated in your number for May 26; but it appears to have been thought that I had made enough to pay part of the expenses of the opposition, although I have not really made a quarter of the amount stated, and had it not happened, unfortunately for me, that my principal counsel (Sir F. Kelly) was taken ill, and unable to be in court, I believe the result of that application would have been very different. As I believe you wish every one to have justice done them in your Journal, I request the insertion of this reply to the remarks I complain of in your Journal, which, if unanswered, might be thought by some to be correct.

Chemical Works, Deptford, June 10, 1874. F. C. Hills.

PROPOSED CORRESPONDENCE COLUMN.

Sir,—You are no doubt aware that the Journal of Gas Lighting has now become an indispensable companion of a great number of managers of the smaller class of gas-works, who, some years ago, heard of it only by name, or, it may be, got a stray copy sent them occasionally. The high price of coal of late, and the growing desire to make the works under their charge yield the best possible returns, fully account for this. While cordially acknowledging the valuable nature of its contents, I would respectfully suggest that its importance would be still further enhanced could you see your way to introduce a correspondence column, where short questions could be put and answered with greater ease than can be done by formal letters requiring a little study and thought. It

may be said that books upon the subject are so common that this is quite uncalled for; but I believe there are little matters occurring every day upon which the authority of the editor or his able staff would prove a guide when in doubt or difficulty. As an example of what is meant, I will suggest three queries:—

1. What is the least amount of dip you would consider safe for pipes in hydraulic mains?

2. When gas is found to carry tarry matter to purifiers, what form of scrubber or washer would you recommend, in addition to the ordinary vertical condenser, in a small work where there is no exhauster?

3. When pipes are suspected of being faulty, whether you would advise to strip the pipes entirely, or cut them in sections and put on a meter during the day in order to ascertain the amount of loss, if any?

R. R.

FOUL LIME AS LUTING.

Sir,—Will you kindly allow me, through your columns, to thank your correspondents, Mr. Bird, Mr. R. K. Moorhouse, and Mr. Robb, for their letters in answer to my inquiries. I have also received letters from several other gentlemen to the same effect, for which I desire to return my thanks. Mr. Reed of the Edinburgh and Leith Gas-Works informs me that the use of foul lime as luting has been almost universal in Scotland in past years, and is so still.

Until I read Mr. Moorhouse's letter, I was not aware that this material had been used for *building* purposes, before Mr. Prideaux, of Sheffield, took out a patent for this use of it in 1869; but I had myself found, by experiment, that it is capable of making an excellent cement or plastic when properly treated.

It would be interesting to many of your readers, I think, if Mr. Moorhouse would be kind enough to give us some further particulars relative to the *mode* of using the foul lime for building purposes.

Granville H. Forbes.

Broughton Rectory, Kettering, June 12, 1874.

Sir,—For information to the readers of your instructive Journal, I beg to say that so long since as 1840, to my knowledge, spent lime from the purifier was used at the Oldham Gas-Works, both as "lute" for retort-lids and for building purposes, under the supervision and management of Mr. George Emmot, C.E. J. M. V. P.

June 13, 1874.

QUALITY OF VIRGINIA GAS COAL.

Sir,—Is there not an error in your estimate of the Richmond, Va., coal, in your issue of the 12th inst., where you value it as high as Newcastle? This company for 25 years has used Richmond, Va., best quality and Newcastle, and we consider it decidedly inferior to Newcastle. That field being on the seaboard, and near the most populous cities here, was opened first, but it surely is inferior to the older coals of the great Pittsburgh basin. Richmond coals are offered in New York at 2 dols. less per ton than best brands of Pittsburgh coals. We are now using West Va. coals from the Ranhawa Valley, and working out better results from them than from any coals we have ever used—10,000 feet, 15½-candle gas from caking, and 10,000 feet, 40-candle gas, from cannel, in actual daily working. We never came near those figures with any imported coals.

Just look up the best authorities in your great London libraries, and you will find I am right, and that newer coal of the Richmond field is inferior to the older coals, and the new coals of Missouri, Ranyas and the Far West are all like the Richmond coal, inferior to the older coals.

Isaac Battin, Superintendent and Engineer.

Albany Gaslight Company, New York, U.S.A., May 27, 1874.

WORCESTER GAS-WORKS AND TOWN COUNCIL.

Sir,—You may well say, in your last Journal, "It must be admitted that there is an odd look about the accounts as *detailed by the Town Council Committee*. For instance, it is said that the contingent and reserve fund is limited by the Act to £5000, yet they stood in the accounts for 1866 at £26,646, but in the following year dropped to £505, 'sweeping at once out of the balance-sheet £26,141.'" If you were to hear all that is detailed by a cabal of our Town Council, you would, I think, be much more surprised and startled than you appear to be by the above single absurdity.

In the autumn of 1865 the manager of our Worcester Gas-Works was found putting the money of the company into a wrong pocket, for which impropriety he was justly visited with a term of penal servitude. Upon this, a gentleman of London, an experienced accountant, was called in by the directors and auditors. The account books were unreservedly placed in his hands for thorough examination, and a statement from the beginning of the company's transactions, in 1845, to Dec. 31, 1865, was made. He found that for extensions and necessary works, almost beyond enumeration, and the payment of mortgage bonds called in, the expenditure had been, during 20 years, £26,646—a sum laid aside and used pretty nearly half-yearly in various amounts. This he called, for convenience, the "Revenue Reserve-Fund Account," when he made out his statement. He found also, as appears on the opposite side of the sheet, a detailment of items of expenditure to the ugly amount of £19,523 13s. 10d., besides mortgages raised in place of those called in, and other amounts, which left £5 8s. 9d. balance to be accounted for in the balance-sheet of June 30, 1867; consequently £26,135 11s. 3d. was swept at once out of the balance-sheet on the opposite side. Thus the £505 has dropped to £5 8s. 9d., which would seem to make the case much worse.

In August, 1866, a special meeting of shareholders was holden, and they resolved "that, in the terms of the Act of Parliament, a reserved contingent-fund should be formed from that date;" and at the end of the year 1867 there appears in the balance-sheet, in one line, "Reserved Contingent-Fund, £500." It also appears in the profit and loss account in just the same manner for the year 1866-7, thus showing plainly that it was the produce of that year. The £5 8s. 9d. also stands in a single line, and it would be wrong if added to the £500, not one penny of which had been created before July 1, 1866. The reserve contingent-fund and a new system of keeping the accounts came in together with 1866-7.

So that to say the "£26,646 reserve-fund" had in the following year fallen to £505 is a gross blunder, and, if not worse, it goes to show that the person who made the statement, "on the strength of the accounts deposited by the company with the clerk of the peace," could not correctly read them.

Such is the ignorance and insolence to which gas companies are too often obliged to submit at the hands of Town Councils, and I hope that our Worcester Gas Company will not be found in the colour painted by a portion of our councillors.

Worcester, June 13, 1874. An Old Shareholder.

Parliamentary Intelligence.

HOUSE OF LORDS.

Monday, June 8, 1874.

A report, from the Standing Orders Committee, that the Standing Orders not complied with in respect of the Wakefield Water Bill ought to be dispensed with, and the Bill allowed to proceed, was read and agreed to.

The Airdrie and Coatbridge Water Bill received the Royal Assent, by Commission.

The Nottingham Gas and Water (now Nottingham Corporation Gas) Bill was read the third time; amendments made, and Bill passed.

The Lymm Water Bill was read the third time, with the amendments, and passed.

The Gas and Water Orders Confirmation Bill was reported from the Select Committee, with amendments.

The Belfast Water, Cupar Water, and Dundee Water Bills, brought from the Commons, were read a first time, and referred to the Examiners.

Tuesday, June 9.

The Lord Chancellor acquainted the House that no further Standing Orders are applicable to the Edinburgh and District Water Bill.

The Grantham Gas Bill was reported, without amendment.

The Horbury Local Board Bill was read a second time, and committed.

The Peterborough Gas Bill was read the third time, with the amendments, passed, and sent to the Commons.

The Gas Orders Confirmation Bill was returned from the Commons agreed to.

The Gas and Water Orders Confirmation Bill was committed to a committee of the whole House, on Thursday, June 11.

Thursday, June 11.

The Wigan Improvement Bill, brought from the Commons, was read a first time, and referred to the Examiners.

The Gas and Water Orders Confirmation Bill passed through committee of the whole House, amendments made, and to be reported Friday, June 12.

A petition against the Edinburgh and District Water Bill was presented from John Romans.

Friday, June 12.

The Lord Chancellor acquainted the House that the further Standing Orders, applicable to the Skipton Local Board of Health Bill, have been complied with; and that no further Standing Orders are applicable to the Dublin Corporation Water, Belfast Water, Cupar Water, and Dundee Water Bills.

The Aberdare and Aberaman Gas Bill was reported, with amendments.

The Wakefield Water Bill was read a second time, and committed.

The Grantham Gas Bill was read the third time, and passed.

Gas and Water Orders Confirmation Bill.—Amendments reported; further amendments made; Bill to be read the third time on Monday, June 15.

Petitions against the following Bills were presented:—Dublin Corporation Water from (1) Dublin, Wicklow, and Wexford Railway Company, (2) Kingstown Township Commissioners; Dundee Water, from Catherine Laird; Edinburgh and District Water from (1) Caledonian Railway Company, (2) Musselburgh and Dalkeith Water Trustees, (3) Chamber of Commerce of Leith, (4) Liberton Water-Works Company, (5) Steamship owners in the port of Leith; and against alteration from (1) Duke of Buccleuch and Queensbury, (2) Marquis of Lothian, (3) Robert Dundas, of Arniston.

HOUSE OF COMMONS.

Monday, June 8, 1874.

The Belfast Water, Cupar Water, and Dundee Water Bills were read the third time, and passed.

The Wigan Improvement Bill, as amended, was considered; amendment made; Bill to be read the third time.

The Neath Corporation, Shipley Local Board of Health, and Westleigh, Pennington, and Bedford Local Boards Bills (Lords) were read a second time, and committed.

The Alliance and Dublin Consumers Gas Bill (Lords) was read a first time, and referred to the Examiners of Petitions for Private Bills.

A petition against the second reading of the Broadstairs Water (No. 2) Bill (Lords) was presented from owners, &c., of property in Broadstairs and St. Peter's.

The *locus standi* of the Cefn, Acrefair, and Rhosymedre Water Company as petitioners against the Wrexham Water Bill (Lords) has been disallowed.

Tubsday, June 9.

Metropolitan Water Supply, &c., Bill.—Report, in respect of non-compliance with the Standing Orders, referred to the Select Committee on Standing Orders.

The Llanelly Gas Bill (Lords) was read a second time and committed.

Broadstairs Water (No. 2) Bill (Lords).

On the motion for the second reading of this bill,

Mr. Samuda said that this bill proposed to establish water-works in a town of 2000 inhabitants, who were already sufficiently supplied by an existing company. He moved, as an amendment, that the bill be read a second time that day three months.

Mr. Pemberton, in seconding the amendment, said that the inhabitants of Broadstairs, who were his constituents, were unanimously opposed to the bill, which would only increase their water-rate. The promoter had constructed 70 houses in a district, and this bill was brought in to enable him to sell the works he had made to a public company. The existing company had laid their pipes so as to supply the district, and no one was in favour of the new works but the promoter and the tenants of the estate.

Mr. Kavanagh said the water supplied by the existing company was bad, and he hoped that the House would send the bill to a committee.

Mr. Goldney said it was always considered inexpedient to authorize a second water or gas company in a small town, seeing that it ultimately fell upon the inhabitants to pay the expenses of the separate plant and machinery. It was better to stop such a bill at the present stage, and not put the existing company to the expense of opposing the bill before a select committee.

After a few words from Mr. Dodds and Sir E. Watkin in opposition to the bill,

Mr. Raikes said that the bill had undergone considerable alteration in the other House, and was now restricted to a smaller area, so as not to clash with the existing company, which had been formed in 1859 without an Act, and now

came before Parliament for the first time, with the Broadstairs Water (No. 1) Bill. He believed that as to the quality of the water there was not much to choose between the two companies.

The amendment was then carried without a division, so the bill is lost.

The Enniskillen Gas Bill (Lords) was reported, with an amendment.

The Padiham Water Bill was reported.

WEDNESDAY, JUNE 10.

MUNICIPAL CORPORATIONS (BOROUGH FUNDS) ACT, 1872.—A petition for alteration was presented from Neath.

THURSDAY, JUNE 11.

The Wigan Improvement Bill was read the third time, and passed.

The Leeds Corporation Water, &c., Bill (Lords), as amended, was considered; amendments made; Bill to be read the third time.

The Hartlepool Gas and Water Bill (Lords) was reported, without amendment.

The Fairfield Local Board, Middlesbrough Extension and Improvement, and Wrexham Water Bills (Lords) were reported, with amendments.

The Nottingham Corporation Gas Bill (Lords) was read a first time, and referred to the Examiners of Petitions for Private Bills.

FRIDAY, JUNE 12.

The Lords amendments to the Lymm Water Bill were agreed to.

A report, that no Standing Orders not previously inquired into are applicable to the Alliance and Dublin Consumers Gas Bill (Lords), laid upon the table.

HOUSE OF LORDS.

MONDAY, JUNE 8.

(*Before the Duke of* BEDFORD, *Chairman; Earl of* CORK *and Lord* BOYLE, *Earl* MANVERS, *Lord* KILDARE, *and Lord* BOLTON.)

GAS AND WATER ORDERS CONFIRMATION BILL (SIDMOUTH GAS ORDER).

Mr. DURNFORD (of Messrs. Durnford and Co., parliamentary agents) appeared for the promoter of the order; and Mr. LOCH (of Messrs. Loch and Maclaurin) appeared for the petitioners.

Mr. DURNFORD, addressing the committee, said that there was only one point in dispute between the promoter and the petitioners against the order "conferring powers on John Dunning, of Middlesborough, in the North Riding of the county of York, and of Sidmouth, in the county of Devon, gas engineer, his heirs and assigns, for the maintenance and continuance of existing, and for the construction of new and additional gas-works, and for the manufacture and supply of gas within the parishes of Sidmouth, Salcombe Regis, and Sidbury, in the county of Devon." The petition was from the trustees of the late George Edmond Balfour's estate. There were several allegations in the petition, many of which the petitioners did not press, and others which the promoter agreed to by certain amendments in the order. The sixth allegation of the petition explained that "a public footpath leads from the eastern end of the esplanade to Salcombe Hill, crossing the river Sid by a foot-bridge, and forms one of the most picturesque walks in the neighbourhood, and is of great value to your petitioners property and a great convenience to your petitioners tenants and other inhabitants of Sidmouth. This footpath and bridge are included in the proposed site." The promoter was bound by the vendor, if he disturbed the footpath, to provide a substituted road and bridge over the river Sid by extending the sea wall or esplanade, and crossing the Sid and forming a road in the line indicated on the deposited plan. The Board of Trade had inserted a clause in the order for enforcing that, but the Local Board of Sidmouth sought that that should be subject to their approval, to which he (Mr. Durnford) objected on behalf of the promoter, because it would render him subject to two boards, one of which was not in any way interested in the district, and the Board of Trade concurred in that view. It was mentioned in the order that the substituted road, &c., was subject to the approval of the local authority of Salcombe Regis. He would call Mr. Dunning, the promoter, who would prove that the property was within the parish of Salcombe Regis, and that the Local Board of Sidmouth had no authority over it at all; and, if power were given to them, they might be placed in very great difficulty in carrying out that order.

Mr. *John Dunning*, examined by Mr. DURNFORD.

I am a civil and gas engineer, and promoter of this order. I have purchased the land shown on the deposited plan, and on which the gas-works are now in course of erection. I produce the deed of conveyance of such land. A footpath crosses the land, with a bridge over the Sid. I am bound by the vendor, in case I interfere with that footpath, to substitute a road and bridge over the river Sid, by extending the sea wall or esplanade, and crossing the Sid, and forming a road on the line indicated in the deposited plan. That road would be an important one, so far as it would enable foot passengers, as well as carriage traffic, to reach the cliff. At present it is only a footpath. I do not know if the present bridge was originally a public bridge. The public, through lapse of time, have obtained the use of it. It was built by subscription. The whole of the land purchased for the site of the gas-works, and the whole of the footpaths referred to, are within the parish of Salcombe Regis. The Local Board of Sidmouth could not in any way be called upon to maintain that bridge, as it is entirely out of the limits of their jurisdiction. The petitioners object to the construction of my works so near the esplanade; at the same time I was quite willing that a clause should be inserted to place the works farther back. The petitioners expressed some doubt as to the boundaries, but I believe the whole of the property is within the parish of Salcombe Regis. I consider it would be very objectionable, after agreeing with the local authority, that the plan should be subject to the disapproval of the local authority of another district, in which no part of the works was situate, and who might have other than the public to influence them in giving their sanction.

Cross-examined by Mr. LOCKE: I am willing that a clause should be put in the bill to prevent me from ever constructing any portion of the manufacturing plant or the gasholders nearer to the esplanade than 60 feet. The pathway is at present altogether on my ground, and is a public pathway. By the substituted way there would be improved communication, as the path would not be so zig-zag as it is at present. I propose to construct a bridge over the Sid in continuation of the esplanade, which will accommodate both foot passengers and carriages.

Re-examined by Mr. DURNFORD: I believe there is a somewhat similar clause in the Piers and Harbours Bill with reference to the Sidmouth piers. I am willing that the proposed clause should be altered, so as to correspond with that clause. That was the original understanding. As you are aware, a gentleman was sent down by the Board of Trade to Sidmouth; and at that time it was agreed that a copy of the clause which then stood in the Piers Bill should be incorporated in the Gas Bill.

Mr. LOCH: Then we are agreed upon that point.

The CHAIRMAN: Then the amendment placed on your bill meets Mr. Loch's view?

Mr. DURNFORD: Yes.

The other clauses of the order were unopposed.

Legal Intelligence.

COURT OF COMMON PLEAS.—WESTMINSTER, SATURDAY, JUNE 6.

(*Sittings at Nisi Prius, before Justice* DENMAN *and a Common Jury.*)

MORTLOCK *v.* GOOCH.

Mr. COCK appeared for the plaintiff, and Mr. WRIGHT for the defendant.

The declaration stated that the defendant unlawfully assaulted, imprisoned, and gave the plaintiff into custody; and that he also libelled the plaintiff by saying that he demanded £10 from him as due to The Gaslight and Coke Company, and that he had attempted to obtain that sum from the plaintiff by falsely pretending that he was a servant of the said company. To this the defendant pleaded "Not guilty" by statute.

The case for the plaintiff was this: The plaintiff had been for a large number of years in the employ of the Gas-Meter Inspection Office; that a number of consumers of gas subscribed to that office, the object being that the accounts of the gas company might be checked. On the 20th of April last the plaintiff went to inspect the meter at the Ledbury Arms, Ledbury Road, Notting Hill. Early in the year that house had been occupied by a Mr. Lilford, who had become a subscriber to the Gas-Meter Inspection Association, and on the 20th of April was the first time that the plaintiff went to inspect the meter after payment of the subscription. He said, "I have come from the Gas-Meter Inspection Office," and was told to go down into the cellar and look at the meter. He did so, and on coming up saw the defendant, but was not aware whether he was Lilford or not. Eventually the defendant said, "I am going to settle with Lilford next Thursday," to which plaintiff said, "This is something that Lilford used to pay for; you may pay or not, as you think proper." The defendant took down the gas company's card, and offered it to the plaintiff to sign. Plaintiff said he had nothing to do with that; upon which defendant remarked, "You have come into my house under pretence of belonging to the gas company, and I will give you in charge." Plaintiff was surprised at this conduct, and the defendant put him behind the bar, let down the flap, and insisted that he should not leave, while he (defendant) sent for a policeman. When the policeman came, defendant said, "I charge this man with having come here, and falely pretending that he was a servant of the gas company, and intending to extort £10 from me as such." No claim for money, however, had ever been made by plaintiff. The policeman hesitated to take him into custody; but he was eventually taken in charge, and conveyed to the station-house, where he was kept till the afternoon. Inquiries having been made in the meantime which were satisfactory, he was liberated.

The defence was that what was done by the defendant was done in pursuance of an Act of Parliament, and that, therefore, he was entitled to notice of action. The ground of complaint occurred on the 20th of April, and on the following day the plaintiff instructed his attorney to write to the defendant, which he did, complaining of the assault, malicious arrest, and false imprisonment, asking for compensation and an apology. To that no answer was given.

The plaintiff was called, and gave his version of the affair.

The defendant denied that he had given plaintiff into custody. At the police-station the defendant said he was a new comer in the neighbourhood, and as the plaintiff acknowledged he was wrong he would withdraw the charge. The plaintiff was an officer in a company for checking the consumption of gas, and he would not trouble him any more. The police inspector said, "Well, that is as good as an apology." However, this action was now brought for damages under the above circumstances. There was a great deal of contradictory evidence contained in conversations and in the different accounts of what occurred at the defendant's house and at the police-station given by each party. A long discussion also arose on points of law raised, and in summing up the learned judge left it to the jury to say whether the defendant *bonâ fide* gave the plaintiff into custody under a reasonable belief that he had endeavoured to obtain money by false pretences.

His LORDSHIP said that it was ridiculous to say that the defendant had not detained the plaintiff and given him into custody; but the question was whether he did it *bonâ fide*, and was so protected by statute.

The JURY having retired, found in the end that the defendant honestly believed that the plaintiff was attempting to get from him £10 by false pretences, that the defendant reasonably so believed, and they assessed the damages at one farthing. A verdict was then entered for the defendant, subject to leave to the plaintiff to move the court *in banco* on points raised.

WEDNESDAY, JUNE 10.

(*Sittings in Banco before Lord* COLERIDGE *and Justices* KEATING *and* GROVE.)

MORTLOCK *v.* GOOCH.

Mr. COCK, for the plaintiff, said that this case was tried on the previous Saturday before Justice Denman, when the verdict was entered for the defendant, but leave was given to the plaintiff to move to enter a verdict for himself for one farthing damages. He now moved pursuant to that leave. The action was one of assault and false imprisonment, and there was also a count for slander. The only plea was "Not guilty by statute," and it was upon this plea tha tthe question arose. At the trial the point was taken that the defendant had received no notice of action, which notice it was contended that he was entitled to under the Larcenies Act; and the learned judge put questions to the jury, who answered that, in their opinion, the defendant did honestly and reasonably believe that the plaintiff had attempted to obtain money by false pretences, and thereupon the learned judge directed the verdict for the defendant.

Lord COLERIDGE: With leave to move to enter a verdict for one farthing.

Mr. COCK: Yes; but the question of costs was far more important than that of damages. The Larcenies Act, 24 & 25 Vict., cap. 96, secs. 88, 103, and 113, enacted that any person who was found committing any offence punishable by indictment or summary conviction by virtue of that Act might be taken before justices, and any person other than a constable might prosecute; and that in all actions and prosecutions against any person for anything done in pursuance of this Act, the defendant should be entitled to a month's notice of action. In the present case, however, the plaintiff was not found committing any offence under the Act, and he was only charged with "attempting to commit," so that the right to notice of action had never arisen. What took place was that, after some dispute, the defendant said that the plaintiff had got into his house by false pretences, and had also tried, by false pretences, to get £10 out of him. Afterwards he told the plaintiff he could go, but the plaintiff said that he would have the matter settled, and thereupon the defendant sent for a policeman, and gave the plaintiff into custody for attempting to get money by false pretences.

Justice KEATING: He was given into custody at his own request?

Mr. COCK: No; he simply said that he would not leave until the matter was settled.

Lord COLERIDGE: You say that the statute does not provide for an attempt to commit the crime.

Mr. COCK: That it only applied to where money had been obtained by false pretences.

Lord COLERIDGE: Would not an indictment lie for attempting to obtain money by false pretences?

Mr. COCK: Not under this Act; though, no doubt, it would be a misdemeanour at common law. In Mr. Archbold's book it was stated that an attempt to commit a statutable misdemeanour was itself a misdemeanour at common law. He contended, however, that it was only the statutable misdemeanour which gave right to a notice of action. In *Leet v. Hart* (3 L. R. Common Pleas 322) it was said that the defendant, hearing a noise by some

men at the back door, believed that there was an attempt to break into his house, and upon his wife telling him that the plaintiff was the man, he gave a respectable neighbour into custody. The judge held there that a notice of action was necessary; but on argument it was held that as the defendant did not believe that his house had been entered, but only that there was an attempt to enter, and this would not entitle him to notice of action under the statute. The offence there in question was "entering any dwelling-house with intent to commit any felony therein."

Justice KEATING: But in this case the jury found that the belief of the defendant that the plaintiff was attempting to commit the crime was honest and reasonable.

Mr. COCK: Still his point remained that this was supposed to be merely an attempt to obtain money by false pretences, which was not an indictable offence under the statute, though possibly it might be indictable at common law. It was only for indictable offences under the statute that notice of action was given.

Justice KEATING: It was a very fine point; for the distinction seemed to be between being indicted for an offence under the statute and being indicted for an attempt to commit it at common law. It was admitted that there might be an indictment, but it was said that it was at common law and not by statute.

Lord COLERIDGE: It is a point that is so fine that possibly it may disappear altogether under argument; but if you like to take the rule you can.

Mr. COCK: I am obliged to your lordship.

Rule granted.

Miscellaneous News.

BRITISH ASSOCIATION OF GAS MANAGERS.

The Eleventh Annual General Meeting of the Members of the above Association was held during the past week at the Society of Arts Rooms, John Street, Adelphi, London.

TUESDAY, JUNE 9.

The first sitting was held this morning. The PRESIDENT (George T. Livesey, Esq., Memb. Inst. C. E.) took the chair at eleven o'clock.

The minutes of the last general meeting, and the statements of account for the past year, which had been previously printed and circulated amongst the members, were taken as read, and, on a show of hands, were confirmed.

NEW MEMBERS.

The SECRETARY (Mr. W. H. Bennett) read the list of applications for membership, as follows:—

ORDINARY MEMBERS.

Amsden, J.	Tring.
Braidwood, J. F.	(Phœnix Gas-Works), London.
Bridge, R.	Doncaster.
Browning, J. T.	Plymouth.
Browning, J. T.	Colchester.
Bush, T.	Beckton.
Chapman, J. L.	Harrow.
Child, W. D.	Brimscombe.
Church, G. F.	Sutton.
Crook, T. R.	Portsea.
Cuthbert, G.	Newcastle-on-Tyne.
Downie, A.	Cleethorpe.
Durkin, S. W.	Southampton.
Eastwood, C.	Batley.
Ellery, C. S.	Neath.
Ely, J.	Abingdon.
Farey, S.	Skipton.
Ford, R.	Newcastle-under-Lyne.
Hamilton, J.	Chertsey.
Hawkins, J. G.	Sheffield.
Hoile, J.	Folkestone.
Hunter, R.	(Phœnix Gas-Works) London.
Jackman, H.	Bingley.
Jackson, R.	Richmond (Yorks
Jones, C. E.	Chesterfield.
Jones, W.	Dalton-in-Furnes
King, W.	Liverpool.
Lacey, J.	London.
Lass, A.	London.
Loxley, T.	Church.
Lyon, J. H.	Macclesfield.
Mann, W.	(Chartered Gas Co.), London.
Mead, F.	Sutton.
Merriman, J. D.	Nova Scotia.
Mitchell, H. J.	Hornsey.
Monk, L.	Lanark.
Morland, R.	Gloucester.
Nicholls, J. S.	Southbank (Yorks).
Ogg, D. W.	London.
Packham, H. T.	Kingston-on-Thames.
Palmer, J. E.	Great Malvern.
Paterson, T. O.	Rochdale.
Pepys, W. H.	Cologne.
Phillips, W. R.	Luton.
Pike, E. S.	Ystrad.
Reeves, J.	Bilston.
Richmond, J.	Worthing.
Ross, R.	Hiogo, Japan.
Russell, W. J.	Croydon.
Sapey, E.	Cambridge.
Saville, G. E.	Sowerby Bridge.
Sellars, C.	York.
Shone, C. G.	Southall.
Swan, J.	Maryport.
Terdrey, C.	Tavistock.
Thomas, J.	Bodmin.
Walduck, C. E.	London.
Walton, T.	Shipley.
Warren, S. H.	Crewe.
Whyte, J.	Seaham Harbour.
Wilson, A. F.	London.

It was unanimously resolved—"That the gentlemen whose names have now been read be elected ordinary members of the association."

The SECRETARY read the names of the following gentlemen, who had applied to be admitted extra-ordinary members of the association:—

EXTRA-ORDINARY MEMBERS.

Bewley, H.	Birmingham.
Colyer, F.	Southwark, London.
Harvey, W.	Plymouth.
Holman, S.	London.
Lloyd, G. H.	Birmingham.
Murphy, D	Manchester.
Sadler, S. A.	Middlesborough.
Varley, W. H.	Colne.

These gentlemen were unanimously elected extra-ordinary members of the association.

PREMIUMS FOR PAPERS.

The PRESIDENT: The next business is to announce the premiums for papers read at the last meeting. You will remember that a resolution was passed to the effect that premiums of ten, seven, and three guineas respectively be given for the three best papers read at our meetings, supposing there to be three papers which the adjudicators thought worthy of such recognition. The adjudicators appointed were Mr. Goddard, Mr. Church, and myself; and the agreement we came to, as a recommendation to the committee, was that the best paper read at our last meeting was that by Mr. Gore, on "Substitutes for Coal in the Production of Illuminating Gas," a paper which was thoroughly exhaustive of the subject. The next paper in point of merit was that by Mr. Paterson, "Notes on the Method of Calculating the Flow of Gas through Pipes." Beyond these, the adjudicators did not think any paper of sufficient interest, novelty, or merit, to warrant them in recommending it for a premium. It should be stated that the papers by Mr. Sugg and Mr. Hartley were read before those gentlemen were elected, therefore they were not eligible for premiums. There is a further question that I have to bring before you. Mr. Croll, our ex-president, has promised to present to the society a die, in order that silver medals may be struck therefrom, to be given as special premiums for the most meritorious papers read before the association. This medal is to be called "The President's Medal for 1873." It was therefore resolved by the committee last night that the medal or £10 should be given to Mr. Gore, and a second prize of £7 to our friend Mr. Paterson, than whom no one deserves it better.

APPOINTMENT OF SCRUTINEERS.

Mr. Norwood Earle, of London, and Mr. Crowe, of Wellington, were appointed scrutineers of the votes for the election of committee and officers for the ensuing year.

The PRESIDENT then delivered the following

INAUGURAL ADDRESS.

Gentlemen,—My first duty is to acknowledge in the heartiest manner my high appreciation of the honour you have conferred upon me in calling me to occupy the presidential chair of this important association. I have next to congratulate you on the continued interest in, and the growing strength of, our society, which, year by year, increases its number of members—adding this day 51 ordinary and 5 extra-ordinary members, making a total of 540—while in every other way vitality is manifested, giving strong ground for the expectation that the position already attained will not only be maintained, but improved and strengthened. The association is not a financial speculation; during the first ten years of its existence, the balance of receipts over expenditure gradually accumulated, until last year the investments amounted to £297 15s. 6d., with a balance of £78 17s. 11d. in hand, which remains after drawing to the extent of £14 17s. 2d. to make up the deficiency of the past 12 months. It is impossible to so adjust receipts and expenditure as to have an exact balance each year; but there is certainly no reason whatever for accumulating to any extent. It would be perfectly satisfactory if the receipts were from £5 to £10 in excess of the expenses; and, to attain this, it is only necessary that some members who in previous years very properly reduced their subscriptions on the ground that the money was not wanted, should now bring them up from 10s. 6d. to £1 1s., which I would suggest as the standard, except for very small works; and, with this, I make the further suggestion that the subscription and travelling expenses should be paid by the gas company, and not by the gas manager, on the strong ground that the gas company derive by far the greatest benefit from the meetings of the association. I imagine directors and committees will raise no objection to this course, which, in a great number of cases, has already been adopted, and would doubtless have become universal had attention been drawn to it.

OBJECTS OF THE ASSOCIATION.

The object of this society is stated in sec. 1 of its Regulations, in these words: "This association shall devote itself to the encouragement and advancement of all matters connected with gas engineering, manufacture, and finance, being established to facilitate the exchange of information and ideas among its members," and let me add, to make us know one another, and thus to promote mutual respect and friendship. The association has now been at work ten clear years, it may therefore be an interesting inquiry how far the object of its existence has been attained. No one can dispute its devotedness to its work of encouraging and advancing all matters connected with our profession. It has collected, by means of its papers and discussions, an amount of information and experience on gas engineering, manufacture, and finance, of which few of us have any idea, and which I venture to say will be appreciated and made use of by the editor of the next treatise on gas. I know no more interesting and instructive reading on our special question than the record of the transactions of this association, and I say this while admitting that there may be found in those transactions, statements and opinions that at the time were untenable, and that are now proved to be erroneous; still I would not on any account have them suppressed, for to them are we largely indebted for our best discussions. Our transactions contain a most valuable record of new and modifications of old processes of manufacture and purification; all that is known in the profession on the subject of most of the difficulties with which gas managers are beset, such as naphthaline, stopped pipes, &c. We have also some valuable information in the shape of an account of various failures, while beyond this the whole chemistry of gas lighting, so far as known, has been exhausted by lectures given by the most eminent chemists of the day, who have taken every branch of the subject until they can find nothing that has not previously been brought before us. The association has further enabled the members personally to inspect many of the largest and best-conducted gas-works in the kingdom, as well as the various manufactories and processes relating to gas and the utilization of products.

The association has thus been the means of increasing the knowledge of its members; it has thereby made them more efficient managers, and has so worked to the benefit of the companies and corporations, which must tell in favour of gas consumers. Accepting the above as the object of the association, and assuming, as I conceive must be done, that the object has been attained to a very satisfactory extent, there can be no necessity to expatiate on the advantages gas managers derive from uniting with it; neither is it needful to press its claims on them, seeing that those claims have been so fully and freely admitted and acted upon. Objections have been made—some valid, some utterly futile. It is a reasonable objection, and worthy of respect, though in my opinion a mistaken one on the part of a conscientious man, to plead that, as he could rarely attend the meetings, he would, as a member, feel he was neglecting his duty, and therefore will not join us. To such an one I reply, that abstaining from membership is probably a greater neglect of duty. You derive, or may derive, considerable advantages from the association, and should do what you can to support and maintain it. Another said, "When you produce papers worth hearing, I will join you;" and to him my reply was, "Come and give us a paper worth hearing, and do not find fault with others who are trying to do their part, while you do nothing at all." A third told me he would not impart his knowledge to all the world by reading papers or making speeches at the meetings; besides, said he, "Why should I do it, seeing that without membership I obtain all the advantages to be derived from the association. I read the transactions in the JOURNAL OF GAS LIGHTING without being called upon to contribute anything." Here I felt argument would be utterly useless, and reasoning or persuasion quite out of place, being

sure the members would not thank me for such an addition to their body, and that they would willingly leave him to the solitary enjoyment of reading the transactions in the JOURNAL.

And here let me express my thanks to the Editor of the JOURNAL OF GAS LIGHTING for the services he has rendered to this association from its first establishment; while as individuals we are also largely indebted for the varied and complete current information contained in the pages of the JOURNAL, and for the able series of articles now appearing on the "History of Gas Lighting."

Further, the business in which we are engaged has become so important that it is incumbent on managers to use all means whereby they may become more efficient. There is very much required of them, whether they have the charge of a small works or a large one. I have often been struck by the advertisements for a manager for a small works, enumerating the qualifications necessary, and have wondered whether such a man could be obtained for the pay offered.

QUALIFICATIONS OF A GAS MANAGER.

To fill the post of manager efficiently, a man's physical and mental powers should be in full vigour; he should have varied and comparatively extensive knowledge of several branches of science; he should be a good mechanical engineer, master of both rough and fine work; he requires a knowledge of building in brick or stone, woodwork and ironwork; he must understand the combustion of fuel, the setting of retorts, and have a practical knowledge of the carbonization of coal; and, having made his crude gas, he has to condense and purify it, store and distribute it, operations requiring considerable knowledge and skill, and more than a smattering of chemistry, especially in these days, when so much stress is being laid on the question of purification. The effective distribution of the gas is no trifling matter, for not only may dividends be said to be made in the retort-house, but they may be lost in distribution unless knowledge, care, and skill are brought to bear. Nor is this all. The manager must possess the power of dealing with a varied body of workmen, a portion of them men who come for a month or two in the winter as stokers—very difficult to manage. Again, he has in many instances the charge of the most extensive business in the town or district over which his supply extends, having to satisfy a far larger number of customers than probably any other person, amongst whom there are always some possessed with an antagonistic feeling towards the suppliers of gas, therefore ever ready to make a grievance and to find fault. Beyond this, if the manager is servant to a company, he has to do with the local authorities. Sometimes it may be a Town Council, sometimes a number of vestries, bodies that are generally on the watch for any default, and, being public servants, I cannot blame them, if they so control individuals among their number as to prevent any unfair or unjust action being taken. The manager has constantly pressing upon him the anxiety lest, through the carelessness of workmen, accidents of various kinds should happen. He has in many cases during the last two years been hardly pressed for a supply of coal, and, knowing that the whole gas supply of his district depends entirely upon him, he has the care lest from any cause the whole or a portion of his district should be without light. It must also be remembered that he is to a great extent responsible for the judicious spending of a large sum of money, which, with all that has been enumerated, relates to the management of a gas-work in full working order, without taking into consideration the increase of business which is continually going on; and when the manager, from a justifiable feeling of pride, or for other reasons, acts as consulting engineer, architect, builder, and everything else for his employers, his hands must be full indeed in these days when anxieties and difficulties have so much increased. I have thus prominently brought this subject forward with the view of drawing the attention of directors and committees to it. There is no doubt that when they have a good manager, they are anxious to treat him well, and I give them full credit for believing they are doing so; but, in many cases, from a want of knowledge (which, where things run smoothly, is almost inevitable) they fail to appreciate the extent and importance of the duties and responsibilities. The salaries paid are sometimes far from an equivalent to the value of the work done; and when to the manager's ordinary duties are added those of designing and constructing all new work, whereby large savings are frequently effected in the expenditure of capital, remembering that most gas-works double their extent in about ten years, he has a still stronger claim to their liberal consideration.

NEW INVENTIONS AND IMPROVED PROCESSES OF MANUFACTURE.

Since the last meeting, several new inventions relating to gas manufacture have been brought out; it is, therefore, incumbent upon me to devote some portion of this address to their consideration. There is the hydraulic stoker of Mr. Foulis, of Glasgow. Mr. West, of Maidstone, has an admirable invention for overcoming the chief difficulties and objections inherent to the present system of carbonization. The past year has been exceedingly prolific in inventions to supersede the dip in the hydraulic main. Then we have had brought to our notice a French invention—Pélouze and Audouin's condenser, for removing the particles of tar and tarry vapour from the gas. There have been improvements in purifying, one of them being a further modification of the system patented by Mr. F. C. Hills, whereby it has been found possible to deprive the ammoniacal liquor of its carbonic acid, and the greater part of its sulphuretted hydrogen, without loss of ammonia, thus giving us a valuable purifying agent. We have also O'Neill's and Johnson's improvements in the treatment of spent oxide, whereby all that is valuable can be extracted. I have to enlarge on the above-mentioned inventions and improvements, because they appear to be genuine attempts to overcome acknowledged difficulties, but before doing so must say a word on another class of so-called inventions, ostensibly for effecting the most wonderful results. The so-called inventors are usually men with little or no knowledge of gas manufacture, either past or present, who, possibly, re-discover some old and exploded scheme; completely lose their heads through the prospect of becoming suddenly rich; find some persons connected with the Stock Exchange, who undertake to form a company; publish a glowing prospectus to catch the fresh generation of fools said to be born every day; fix the nominal capital, in order to be sufficiently attractive, at some hundreds of thousands, of which the inventor—nominally—takes a large slice in shares for his invention, as well as a good round sum in cash; of this, however, he does not get the full benefit. Then the shares, even before allotment, supposing the trick to take, are quoted at a premium; transfers are made; the promoters take care of themselves; the confiding investors are for a time buoyed up with grand promises; and, at last, the dull reality dawns upon them, the scheme collapses, and leaves them poorer and, to be hoped, wiser men. Thus, owing to a belief, fostered by certain persons, that we gas managers are utterly incompetent and opposed to all improvement, the opportunity is given to these schemers to act as described. I have very little sympathy for the dupes who lose their money, but it does produce a feeling of anger that money, which might be used in the development of legitimate trade, and so promote the general prosperity of the country, should find its way into the hands of unprincipled gamblers. I do not object to the formation of a company to work out an invention, but let the thing be done in an honest manner; let the inventor be provided with funds for his purpose, and let his reward depend upon the success of his invention. It is utterly opposed to all rules of common sense or business to pay beforehand, and, when this is proposed, the scheme may generally be considered as unworthy of confidence.

I will not insult your common sense nor waste your time by referring more particularly to these stock-jobbing speculations; I could not trust myself to do so, and will therefore at once proceed to refer briefly to the real and honest inventions of the past year; but seeing that several of them relate to stoking, a word may be spared for the steam stoker, which has not yet come into general use, owing possibly to the necessity of either building retort-houses specially adapted to it, or effecting considerable and expensive alterations in those now existing, which, coupled with the cost of the apparatus and the cost of working, as well as the royalty for the use of the patents, makes steam stoking as expensive as hand labour, and, while this is the case, the other advantages claimed for it are not likely to be considered. It has always struck me that, for the work to be done, the machine is very cumbrous. It has certainly appeared to do the work well and quickly, but when it is considered that to draw or charge a retort is within the power of one strong man, it seems an anomaly that a machine of several horse power should be required as a substitute. I hope that improvements may be effected that will overcome all the objections, and that those who have laboured so perseveringly against all manner of discouragements may yet have their reward.

Referring now more fully to the inventions already enumerated, it is not necessary here to enlarge on that by Mr. West, of Maidstone, seeing that a full description is to be given us by the inventor himself; but I feel bound to state that Mr. West worked out his invention solely at his own cost and risk. He has been exceedingly anxious to get a number of full-sized settings at work for a month or six weeks before this meeting, but, from causes entirely beyond his control, this object has not been attained. I visited his works a few days back, and there saw sufficient to convince me that the trial he wished to make would be quite impossible. I was exceedingly pleased with the perfection of the arrangement and the ease with which it was worked, and having said this will leave the description in his hands.

The hydraulic stoker, invented by Mr. Foulis, of Glasgow, one of our vice-presidents, seems to promise great things. I have not seen it; therefore am able only to form an opinion of its merits from the descriptions that have appeared in the JOURNAL OF GAS LIGHTING. It must be remembered that a chief, if not the greatest, difficulty in drawing a charge arises from the swelling of ordinary coal during its carbonization, which does not occur where cannel is largely used. It is, I presume, owing to this fact that the rake-head is not required to be moveable, and that in this position it can be passed over the coke; further, the coke from a non-caking coal must be very easy to draw, thus largely reducing the power required for the operation. The machine appears to be simple and cheap in its construction, light, handy, easy to work, and very efficient for its purpose, while the small power needed to work it—less than 70 lbs. on the inch of hydraulic pressure—indicates that it has been admirably adapted to its work. I hope it will shortly be tried where Newcastle coal is used, to test its capability of drawing this class of coke, and that, before our next meeting, we shall have seen whether Mr. Foulis has had the honour of overcoming one of the gas manager's greatest difficulties, adding at the same time another triumph to the long list of those already inscribed on the banner of mechanical skill, whereby the human frame has been relieved from exhausting labour.

Since writing the above, I have been informed that the machine has been found to act perfectly with caking coal, the plan of drawing being to take out the charge by two or three operations instead of one.

I ought not, while on this subject, to fail to mention that Mr. Mann, who was for many years engineer to the City of London Gas Company, has been directing his attention to the improvement of the steam stoker, with the view of making it more handy, and so reducing the power required to work it, and, therefore, less costly. He has modified the plan of charging, and added a kind of slice or scoop to the drawing arrangement, which, passing under the coke for some 2 or 3 feet into the retort, greatly assists the rake in its work. It seems that with caking coal something of this sort is necessary. Also in the JOURNAL OF GAS LIGHTING, of the 7th of April last, there was an engraving with a description of further improvements in the steam stoker, by Mr. W. Richards, who has been working with the object of simplifying its arrangement.

We come next in order to the substitutes for the dip in the hydraulic main. Opinions are divided on the desirability or the necessity for such inventions. It is an undoubted and undisputed fact that pressure to any extent in the retort is in every way objectionable. It was the discovery by Mr. Grafton that this was the principal cause of the deposition of carbon in the retort that led to the introduction of the exhauster, even before clay retorts came into general use; and, now that they are used, it becomes more necessary than ever that the pressure should be removed or reduced to a minimum, for, in addition to the deposition of carbon, with all its attendant evils, there is the loss by leakage through the pores or cracks of the retort to be prevented. Many contend that the exhauster alone meets the difficulty; that by its means any desired condition as to pressure in the retort may be attained. This I am not prepared entirely to deny, but all must admit it is very difficult of accomplishment. There are many disturbing causes, and, supposing them to be removed, even the action of the dip itself causes a considerable oscillation of pressure in the retort, as shown on a gauge attached to the mouthpiece. Whether the giving the gas a perfectly free passage, and working in the retort at, say, from a level gauge to ¼-inch pressure—for in no case must a vacuum be permitted—is worth striving for, is quite an open question. If, as some say, by working in this way a largely increased yield of gas is to be obtained, then by all means let us endeavour to accomplish it, provided the cost and trouble of doing so do not counterbalance the advantage to be derived. To make separate mention of all the contrivances that have been brought forward during the past year would only weary you; I shall, therefore, content myself with saying that I consider it desirable such an invention should be self-acting, not liable to get out of order, very simple and inexpensive, capable of ready adaptation to existing apparatus, and one that, should it get out of order, would not interfere with the free passage of the gas. The plan patented by Mr. Hawkins, of Sheffield, displays, perhaps, the greatest novelty of principle; but whether this or any other will be found to perfectly answer the purpose can only be proved by working. I hope that all these inventions will be fairly tried.

While on the subject of the hydraulic, I would briefly draw attention to the advantages of reducing the space below the bottom of the dip, as described in a paper read before the association two years ago. At the South Metropolitan works, all new mains have been constructed on this plan, and all the old ones have had false bottoms put in, with the result that, after three seasons use, there is no accumulation whatever of thick tar; the tar is always fluid, and stopped dip-pipes are unknown. It does not, however, affect stoppages in the ascension-pipes.

Passing from the hydraulic, a considerable amount of attention has been given to the question of condensing, with the result that the opinion is becoming firmly established that in few, if in any, works are the condensers of sufficient extent (I do not say of sufficient power). It appears to be necessary, not only to reduce the temperature of the gas, which may be done very effectively by means of water condensers, in a small space and in a short time, but to do it in a certain way, gently and very gradually, and for this purpose a considerable extent of large pipes, exposed to the air, but protected from the sun, seems to be the simplest and cheapest plan. From some experience of this system, to say nothing of the better abstraction of ammonia and, with it, carbonic acid and sulphuretted hydrogen, I believe that more of the illuminating constituents are left in the gas, and less naphthaline is deposited in the mains and services. As a fact on the other side, I may mention that some years ago, having a water condenser of great power but not of great extent, I was advised by an experienced gas maker to turn on a larger quantity of water, in order to cool the gas more rapidly and effectually, with the result that within a fortnight all the mains and connexions under the purifiers were completely choked with naphthaline, while neither before nor since has there been any similar effect produced, which I attributed solely and entirely to the

sudden cooling of the gas, the temperature having been reduced in about one minute from 120° to 60°, while probably 10 or even 15 minutes would not be too great a time for the cooling of the gas, passing it first through a large air condenser, then through one under water, and finishing in a vessel of large area, to give an opportunity for the deposition of the very fine particles of condensed vapour.

A most forcible illustration of the necessity for ample time in these operations, where mixed gases are concerned, was given in this room by Dr. Odling in 1868, in one of his admirable lectures to this association. He showed a tube filled with pure ammonia gas, which, on being brought into contact with water, was instantly absorbed, the water completely filling the tube. He then experimented with a similar tube, containing 75 per cent. of ammonia gas, mixed with 25 per cent. of air, in which the process of absorption went on with exceeding slowness, not being completed even at the close of the lecture.

The next invention to be noticed is Messrs. Pélouze and Audouin's condenser, of which very full descriptions appeared on pages 878 and 1004 of last year's JOURNAL OF GAS LIGHTING. Its object is to overcome a difficulty very commonly experienced—that of arresting the finer particles of tarry vapour, which in many cases, even with good condensation, pass on to the purifiers. It has been found that something more than mere cooling is needed, and hitherto the means adopted or recommended have been either a water-washer or a vessel of large area, through which the gas passes on leaving the condenser. The latter plan, by bringing the gas almost to a state of rest, affords time for the particles of vapour to coalesce and fall, gives very good results, though probably by the use of a washer the work is done more effectively, but there is the drawback of pressure. The new mode of condensing is founded upon the principle that the liquefaction of the globules held in suspension by the gas is brought about by contact of the particles with solid surfaces and with each other. The action is as follows:—The gas is made to flow through a series of holes of about 1-16th of an inch in diameter, so forming jets, which strike against a surface placed opposite, at a distance of 1-16th of an inch. In the passage of the gas through the holes, the liquid molecules are brought into close contact with each other, and the action is completed by the contact with the solid surface upon which they strike, where the tarry matter is deposited. It is found to be sufficient to pass the gas through three perforated plates placed very close together, thus giving two surfaces on which the jets of gas strike; and, in order to give the necessary velocity, it is found that a pressure of about five-eighths of an inch is required. The apparatus is undoubtedly very compact, effective, and ingenious; but too much was claimed for it. At first it was stated that it removed ammonia, sulphuretted hydrogen, bisulphide of carbon, and naphthaline; but that it did not cause the gas to lose any of its illuminating constituents. A description, with a price list, was sent from France to those interested in gas manufacture, and pasted in it were two test-papers taken at the inlet and outlet, one with a perfectly round black spot, produced by particles of tar, while the other paper was clean. This is all that is now claimed for the apparatus, and this object it appears to accomplish very effectively.

I now come to consider an idea and a system that cannot be called new, but that has received a further development within the past year, whereby its chief remaining difficulty has been overcome, while, owing to the trouble about sulphur, one of the capabilities of the system has been brought prominently forward. I refer to purification by means of ammoniacal liquor. Nearly 20 year ago, Mr. Richard Laming tried at both the Bow Common and the Old Kent Road works to effect the removal of the sulphuretted hydrogen by first depriving the liquor of that impurity by passing it through oxide of iron. The liquor so purified did purify the gas, but nothing was gained by the plan, seeing that oxide had to be used to absorb the sulphuretted hydrogen, and this not in a direct but in a roundabout, and therefore a more expensive manner, while a considerable quantity of ammonia was lost. The only good resulting from the experiment was the proof that ammonia purified from sulphuretted hydrogen did purify the gas, and this was a great advantage, which served as a stepping-stone for further improvement. Thus the matter rested for some years, when Mr. H. Hathaway, now of the Tynemouth Gas-Works, in conjunction with myself, worked out a process whereby the liquor was deprived of its sulphuretted hydrogen by means of the waste gases from the furnaces; the sulphuretted hydrogen was, in fact, completely displaced by carbonic acid, and, strange to say, this liquor, which must have consisted of carbonate of ammonia, was found to be capable of greedily absorbing sulphuretted hydrogen from the gas, which was absolutely cleansed from this impurity. The scheme failed, after working the greater part of a year, from the loss of ammonia. At the present time there would be another cause that would render it impracticable—the non-removal of carbonic acid, which is now so clearly proved to stand in the way of effective purification. It may not be here out of place to express my sense of the obligation under which we stand to Mr. Patterson for clearing up this point. It was, of course, known before Mr. Patterson's time that carbonic acid would displace sulphuretted hydrogen from lime; in fact, Mr. William Mann, of the City Gas-Works, took out a patent, some 20 years ago, for rendering the lime in a fouled purifier innocuous by blowing through it the waste gases from the furnaces, thus, by means of carbonic acid, displacing the sulphuretted hydrogen which was driven off and burnt, but it was not until the sulphur question was brought so prominently into notice by the difficulty experienced at Beckton, that the important part played by carbonic acid as an obstructive was made clear, and for this knowledge I think we are indebted to Mr. Patterson, who, at a time when all the engineers and chemists were fairly puzzled, collected a vast mass of facts and information, which he acknowledges he freely obtained from the officers of the different gas companies with which he, as referee, had to do, and by much thought and labour in comparing and arranging these statistics, he was led to the conclusion that the presence of carbonic acid was the cause of the failure to effectually reduce the sulphur compounds where lime was used, and, what was better (for others may have made the same discovery and have arrived at the same conclusion), Mr. Patterson, in an official report, stated the thing so clearly that no one has since pretended that there is any difficulty in reducing the sulphur compounds where the purifiers are of sufficient extent and it is possible to use lime.

I now return to the liquor. Mr. F. C. Hills, some six years back, patented a plan which, by simply heating the foul liquor, deprived it of its combined CO_2 and SH_2, producing a rough caustic ammonia, capable of purifying the gas from SH_2 as well as CO_2, on the necessity for which Mr. Hills laid particular stress. It was found, on making a working experiment, that the purified liquor did its work very effectually; but there was the old difficulty with the ammonia, the loss of which, coupled with the fact that the removal of the CO_2 from the gas was not considered of primary importance, led to the abandonment of the experiment, seeing that SH_2 could be so cheaply and effectively removed by oxide only. The ammonia apparatus was fortunately left standing at the gas-works, and, when it became clear that, in order to reduce the sulphur compounds, it was before all things essential to remove the carbonic acid, a further experiment was made. The heating of the liquor was not carried to so great an extent, and simpler means were adopted whereby the expense was reduced, and the loss of ammonia prevented, with the result that by using a liquor not brought quite to the caustic state, the whole of the gas made at the South Metropolitan works has for the last three or four months been deprived of its CO_2 to such an extent that, on leaving the scrubbers, there is hardly a trace of this impurity, it taking three minutes before cloudiness in lime water begins, with the gas bubbling rapidly through it. In testing for CO_2, care should be taken that the gas is free from SH_2, which interferes with the action of the CO_2 on the lime water; it is therefore necessary to pass the gas, when SH_2 is present, through a little oxide in a small vessel before blowing it through the lime water. Then the test should be closely watched, for the continued application of CO_2 dissolves the cloudy precipitate, producing a soluble bicarbonate, and the water again becomes clear. A continuous test is, therefore, impossible.

I am, therefore, decidedly of the opinion that this liquor process of Mr. Hills is by far the simplest, the best, and the cheapest plan for removing CO_2, and with it a considerable proportion of the SH_2, the small portion left in the gas being taken out by means of a small quantity of lime, which, having no interference from CO_2, not only takes out the SH_2, but also effectually reduces the sulphur compounds.

This sulphur bugbear has of late made the lives of many gas managers, who have spoken to me on the subject, a perfect burden to them; and I speak feelingly, for it has caused me more annoyance than all other things put together, even in these difficult and anxious times, when we have been so troubled about coal and labour, &c. Last year, even with ample purifiers at the Kent Road, lime could not be used to any considerable extent, owing to the great pressure caused by its hardening by the absorption of carbonic acid, and, besides this, there was the intolerable nuisance of removing and disposing of that which was in the condition of sulphide. I do not like seeing the poor fellows who, to earn their daily bread, are obliged to do such work, breathing the dusty, stinking stuff; and, sometimes when standing in a purifier at such times, I have had the malicious wish that those persons who make such an outcry about sulphur could be compelled to occupy that position only for an hour once a week, until they promised to keep quiet for the future. I venture to say the promise would soon be given. I have no objection, but, on the contrary, should be glad to remove these sulphur compounds—not that I believe they are either perceptible or injurious in any way to the consumer, certainly not to his health, but they are of no certain use in the gas. Therefore, as so much fuss is made about them, they had better be got rid of; but to leave the beautifully perfect system of purifying from SH_2 by oxide, and to go back to the barbarism of lime exclusively, is more than I can stand. At the South Metropolitan works is one of the best foremen in England; but, last winter, the anxiety caused by the order of the referees as to sulphur forced him to say, "I cannot stand this; let me retire." The inhabitants of the neighbourhood surrounding a gas-work, almost exclusively poor people, ought also to have some consideration on the question of nuisance arising from spent lime. I, therefore, look upon the perfect carrying out of this plan of Mr. Hills with great hope, and believe that, at a small outlay, without additional purifiers, without loss of ammonia, and without nuisance, the gas will be purified from CO_2, SH_2, and the sulphur compounds in a satisfactory manner, and am now engaged in erecting a duplicate apparatus on the new plan for treating the liquor.

It is well known that the presence of CO_2 in the gas diminishes the illuminating power; it is therefore worth while, on that ground alone, to remove it, though the result of its abstraction by lime alone has not raised the quality of the gas so much as might have been expected, probably owing to the absorption by the lime of some portion of the hydrocarbons. Whether this be so or not, I can state that while using nothing but Newcastle coal from the Holmside Colliery, without a particle of cannel, the gas has never been below 16 candles, and has averaged 16·5, which I attribute partly to the slow condensation, and partly to the removal of CO_2 by the liquor process.

Oxide, however, is not yet doomed to extinction. Within the past year means have been perfected for the recovery from the waste material of a number of valuable products; for converting, in fact, the whole of it into money. By O'Neill's and Johnson's process the salts of ammonia are first dissolved out, then the oxide is treated, by a most effective and simple arrangement, with bisulphide of carbon, which extracts the sulphur and converts it into a marketable form. Next, a quantity of Prussian blue is abstracted by means of caustic soda, and such oxide as remains is restored to its original active condition for purifying gas. The result of these operations being that already gas can be purified for nothing, so far as material is concerned, and, probably, in a not far distant future, the purification of gas by oxide of iron may become a considerable source of profit to gas companies.

I have not mentioned all the inventions of the past year. There is, for instance, the new burner invented by Mr. Silber, which has not yet appeared, though promised last month. There is also Wilson's patent inclined retort-setting, which is certainly worth an experiment, possessing as it does several valuable features; a swell, probably, as several other inventions that only need a trial to develop their advantages.

CONDITION OF THE COAL MARKET.

The coal question demands notice on this occasion, and, in doing so, it may not be out of place to give a short statement of the rise and fluctuations of the price of this article during the past two or three years. In the spring of 1871 contracts were made at the old rates—viz., 6s. per ton, less 2½ per cent., free on board in the Tyne, with an ingrain of 5 per cent., or 21 cwt. to the ton, thus making the price something like 5s. 6d. per ton—a rate barely remunerative, and one that we must not expect to see again. Prices remained without much alteration during the year 1871, but in the autumn some difficulty was felt on the part of the collieries in meeting the demand, which resulted, in the early part of 1872 in an increase of price that at the time was considered enormous. In the spring of that year contracts were made at 8s. 6d., less 2½ per cent., free on board, the coalowners refusing to give the usual overweight of 5 per cent.; by Midsummer the price had reached 14s.; in August as much as 25s. for odd cargoes; and in September, I believe, as much as 27s. was obtained for a single cargo of Pelton coals; in October purchases were made at 18s.; while at the close of the year contracts for 12 months could have been made at 16s. On the 1st of January, 1873, the new Mines Regulation Act came into force; in February, 20s., less 2½ per cent., without ingrain, was the contract price; in July it was 18s., less 2½ per cent.; in September, 1s. less; and in December, 15s. net. In January, 1874, the price was 14s., less 2½ per cent.; and in April it came down to 12s. 6d. net. During the past month or six weeks some of the London companies have made contracts for the bulk of their requirements up to Midsummer, 1875, at prices ranging from 18s. 6d. to 19s. 6d. per ton, into barges in the Thames, which leaves something like 12s. as the cost of the coal free on board in the Tyne; and this week, I have heard, a contract has been made for a large quantity at about 10s. 6d. per ton. Some of the smaller companies are adopting the plan of making short contracts, purchasing a three months supply from time to time, and thus reaping the benefit of every fall in price.

In the old times, when the price of coal did not vary 6d. per ton from year to year, the practice of making annual contracts was perhaps the best possible, and, as soon as prices again become steady, may be reverted to with advantage. If, with a probability of a fluctuating market, contracts are made for long terms, the element of speculation is introduced, which, in a business such as ours, may be productive of unsatisfactory results—the company may get the best of the bargain, or an undue advantage may fall to the lot of the contractor, neither of which is really desirable. It would, in my opinion, be better as far as possible in all cases for a gas company to adopt such systems in buying coals, or in selling coke, tar, and ammonia, as should ensure the current rates of the day for the purchases and sales. I do not say it is possible in every case to carry out a plan of this sort to the letter, while some may say it is not desirable, and will point to the benefit derived by those companies whose coal contracts, made at the old rate, gave them coal at low prices during the earlier period of the late panic. Undoubtedly there was an apparent advantage, which prevented an increase of price for a time, but only to become more than ever necessary on the expiration of the favourable contracts, and the making of new ones at high rates, which continued in force until the price had receded considerably, and coke was proportionably reduced. The increase in the price

of gas had then to be much greater than would have been sufficient 12 months previously, and had to be made at a time when the consumers believed the necessity had passed, and were therefore greatly disappointed.

This speculative system has a further disadvantage. It occasionally happens, when a contract turns out unfavourably to the contractor, that he applies to the company for a modification of its terms. On the other side, however adverse a contract may prove to be to a company, they could not apply for an alteration, though I have known cases where a contractor has voluntarily surrendered a portion of his profits. When such a man is found he will doubtless be fully appreciated. To me, therefore, it seems clear that with coal steady at low rates, a year is a very suitable term for a contract; but with a fluctuating market, the shorter the term the better, the only limit being the necessity to make sure of a sufficient supply to keep the works going, and for this six weeks or two months stock on the premises is the best security.

VALUE OF RESIDUAL PRODUCTS.

As to products, the sale of coke is usually to a considerable extent a ready-money trade, and, as a rule, the nearer it is kept to this, and the lower the stock in hand, the better. In the whole of my experience I have known only of one instance where it answered the purpose to stock coke, and that was during the months of December, 1872, and January, 1873, the price in London at that time being 12s. a chaldron, and the coke then placed in stock was sold in the ensuing spring and summer at from 20s. to 26s. per chaldron. All, however, that was gained by stocking last year has been lost this, for coke accumulated last autumn, while the price was kept up to 18s. or 20s., has been, or will have to be, sold this summer at prices considerably below 12s. per chaldron.

It therefore seems clear that, so far as coke is concerned, it should be sold at current rates as it is made, unless in some particular town or district, where the summer price is some 4s. or 5s. above that ruling in winter, and even then the profit is hardly worth the trouble.

In selling tar and liquor, contracts for one, three, or five years are almost universal at a fixed rate for the term, and, when this extends but for one year, neither the contractor nor the company will be likely to lose. These short terms are strongly objected to by contractors, on the ground that it will not answer their purpose to provide plant and make arrangements for an extensive business which they may be deprived of at the end of a year. In this objection there is great force, hence the adoption of longer terms, which, for ammonia especially, are very speculative. The price of sulphate of ammonia has, at the beginning of such a term, been known to be £14 a ton; it has gone down to £10, and then up again to £18. Again, it has started at £14, and gone up to £22, then down to £18; part of the time going against the company, part against the contractor, satisfactory to neither. Out of this difficulty there is a ready way of escape, easy of working and perfectly fair to both parties, therefore satisfying both. It is the adoption of a sliding scale, whereby the price paid for the liquor is regulated quarterly or half yearly by the market value of sulphate of ammonia, should the value of that article have altered during the preceding three or six months.

This plan has, during the last five years, worked admirably. Possibly the highest price reached has not been quite equal to some of the contracts entered into when sulphate was selling at £20 to £22, but, taking the average of years, companies selling on this system will be found to do better than those that make fixed contracts, because a contractor who can make sure of a continuous regular business will be content with a lower profit, seeing that he is saved from the risks attendant on a fluctuating market so far as raw material is concerned. Having said so much, I feel it to be necessary to fully explain the system, and, for the purpose of an illustration, will take even figures. The basis is, of course, the price of sulphate while the liquor is sold at so much per butt of 108 gallons, according to its strength in ounces of sulphuric acid required to saturate a gallon. It is found that ½d. (one halfpenny) per ounce per butt is very nearly the equivalent for each 20s. per ton in the value of sulphate; thus, supposing sulphate to be worth £18 per ton, the value of the liquor would be 18 halfpennies, or 9d. for each ounce of strength per butt; 10-ounce liquor at this rate would sell for 7s. 6d. per butt, 9-ounce for 6s. 9d., and 11-ounce for 8s. 3d., and so on. With sulphate at £16 per ton, each ounce of strength would be worth 8d.; therefore, 10-ounce liquor would fetch 6s. 8d. per butt., and other strengths in proportion. Under this system either party can, of course, terminate the contract by giving an agreed notice of, say, six months; but it will be found that, under all ordinary circumstances, such a contract will run on continuously from year to year, with the well-satisfied concurrence of both parties.

With tar such an arrangement is more difficult, there being so many products obtained from it which materially affect its value: still, the advantages are so great that it is worth an effort to obtain them. In London, the market value of tar being tolerably well known, a running contract could be made, the price to be subject to revision once a year, with a proviso that either party should have the power to terminate the contract on giving six months notice. The present system of contracts, at fixed prices for a fixed term, is tending to drive all the smaller tar distillers out of the field. There are a number of respectable men of good credit who are capable of dealing with the tar from any *one* large works, but are unable to take several contracts. They are thus dependent on the one only, and, at its termination, run the risk of losing it, and with it their entire business. This has occurred, and it will be seen at once that it is not to the advantage of gas companies that there should be but one purchaser of their tar. I commend these facts and arguments, against a speculative element in our business, to your consideration, from the conviction that the adoption of an opposite system would be a benefit to all concerned.

THE LABOUR AND SUNDAY REST QUESTIONS.

A source of great anxiety to gas managers has been, and is still, the difficulty of dealing efficiently with their workmen. Undoubtedly the advance of wages so universally applied for, or expected, has been founded on circumstances that must be admitted in many cases to be a justification for the claim. Where such grounds exist for an advance, I hold it to be to the interest of the manager, as well as his duty, to be the first to move in the matter, for I have found that men in regular constant employ, being generally steady, honest workmen, do not often make a request for an increase unless they have fair reasons for doing so, and it is a mistake to wait until they make the application. I have felt, when this has been the case on the part of a good servant, that I had done him an injustice in not giving him the advance unsolicited. I would further say, "Do not put a man off with excuses. Consider the matter at once, and give him an answer. If he is already sufficiently paid, tell him so; but, if not, remember that 'he gives twice who gives quickly;' and from that day let the extra pay be granted." So small a sum as 3d. or 6d. a day may make all the difference between a contented and a discontented workman; while the one may be worth, in the value of the work done, twice or four times that amount more than the other.

It is all very well to say that the price of labour, like that of coal or iron, is regulated by the inexorable law of supply and demand; but this law, though perfect in its application to the purchase of materials, has only a partial application where a man's labour is concerned. You may by this rule purchase his time, but something more is required to obtain his good and willing service. Happily, as a rule, gas managers know of what this something more consists, as evidenced by the length of time their men stay in their service. It is not merely fair payment that is wanted, but considerate treatment also, and this leads me to a subject that must not be passed over in silence. The greatest hardship connected with gas making is when men are compelled to work seven days a week. At one time we all looked upon this as a necessity, and so thought very little about it. Thanks, however, to the exertions of Mr. Morton, of the London Gas-Works, one of our vice-presidents, who has taken the foremost part in this matter, and to the wise and judicious manner in which this question has been taken up by the Rev. John Gritton, secretary to the Lord's-day Observance Society, our eyes have been opened to the necessity of relieving the stokers, as far as possible, from Sunday labour, with the result that it has been found to be quite possible to give a large proportion of the men complete relief from labour on that day. It is now the practice in a great number of gas-works, large and small, not only in London, but throughout the country, to cease working during the 12 day hours. The dampers in or leading to the chimneys are closed; some of the yard men, by turns, look after the fires, which need very little attention, and the whole of the retort-house men are relieved from duty. They lose their pay, of course, which they are quite content to do for the sake of the day's rest. The relief thus given, after all, amounts to but one day off in a fortnight, seeing that work goes on as usual during the night. That which has been effected is not all that could be desired; but at present it has been found difficult to go beyond it. Where 8-hour shifts are worked, 16 hours relief might perhaps be given; but whatever extension may be found possible, it is quite clear that the whole of the gas-works in the kingdom might do much in the direction of diminishing Sunday labour. It is not now new ground, for men are to be found in every district who would be glad to show their neighbours how the thing may be accomplished. It is not pretended that to cease working for 12 hours will be found directly profitable; but that it has advantages, merely from the company's point of view is undoubted. However this may be, whether loss or profit result, the thing is right. It can be done, it ought to be done; and shareholders, directors, and managers who withhold an inalienable right from their fellow-men, which is in their power to bestow, are incurring a responsibility that no man of just and right principle would be willing to bear. It is no excuse to say the plant is not sufficient. Money could be readily found to make it so, if man's law required it, nor to say the men would not properly use the day if granted; for this they are responsible, when we have done our part in freeing them from labour.

In some cases the wrong is carried even further—the average week-day consumption is in excess of the average week-day make, and on Sunday the works are kept at their full power, in order to make up the deficiency of the six working days, and to fill the holders on Sundays for a fresh start. Attention drawn to the fact will surely be sufficient.

RECENT LEGISLATION AS AFFECTING GAS COMPANIES.

As to legislation, the only general Act passed since our last meeting is styled "The Gas and Water Facilities Act, 1870, Amendment Act," which was introduced by the Board of Trade for the purpose of affording relief to these provincial gas companies that, owing chiefly to the great advance in the price of coal, were in danger of working at a loss if confined to the limit of price fixed in their special Acts. The proposed relief was, however, reduced to very narrow limits by the resolutions Lord Redesdale had succeeded in previously passing in the House of Lords, to the effect that any increase of price to be granted should be only for a limited time, which the Act fixed at not exceeding three years. Further it was enacted that, in allowing such increase, the company should not divide more than 5 per cent.; or, if 5 per cent. had not been paid in 1871 and 1872, the dividend to be allowed should not be more than the average paid in those two years. This Act was passed in August, 1873, and was limited, so far as applications under its authority were concerned, to eight months only; it is, therefore, now a thing of the past to all companies except the two or three that have made use of it. The terms were so hard that the great majority of companies that felt the pressure of the high price of coals, and were charging their maximum price, preferred their present condition, with its chance of amelioration, to making use of the Act.

By contrast with the conditions under which three of the London companies could obtain permission to charge such a price as would enable them to pay their full dividends, this Act was felt to be most unfair. To me it seems that the revision under the Chartered Act of 1868, which took place in April last year, and gave that company power largely to increase its price in order to pay 10 per cent., had something to do with the restrictions imposed on provincial companies that were in similar difficulties. It was probably felt, and with justice, that to give to gas companies an absolute guarantee that their dividends should always be maintained at their maximum must not be again permitted, hence an error on the other side.

This brings me to a consideration of the London Acts of 1868 and 1869, under which the Imperial Company has obtained permission to charge, during the present year, 4s. 8d. per 1000 for 14 nominal, really 16, candle gas; and the Gaslight Company 5s., for gas of 16 nominal, really 17, candle power—the parliamentary limit of price with both companies having been 3s. 9d. per 1000 feet.

The Acts of Parliament that have produced or permitted this result were founded on the celebrated resolutions of the committee over which Lord, then Mr. Cardwell presided, in which the words "due care and management," as entitling the companies to their full dividends, were introduced, solely for the purpose of protecting the consumers against excessive charges. The position in which you have placed me is one that compels me to endeavour to look at these matters in an impartial spirit, and, should I be charged with making statements or expressing opinions apparently adverse to our special interest, I shall contend that the interests of gas companies are so closely bound up with the interests of their customers that the two are really identical.

It is now universally admitted that the supply of gas must be a monopoly, of which we are the fortunate possessors; but the objections to all monopolies are so great that nothing but necessity can justify them. It is, therefore, of the utmost importance, if we would retain our position, that our customers should be satisfied, which I unhesitatingly contend is possible of attainment. There are, and always will be, here and there, discontented persons always ready to find fault and to take any advantage; but the heart of the British public is in the main right, and just dealing will be appreciated. Now, the system inaugurated by those Acts of Parliament referred to has fostered the idea on the part of gas companies that, come what may, they at least are to be protected, and that, under any circumstances, they are to be guaranteed their full dividends.

This system was founded on a principle of justice. Gas companies are limited as to dividend; they are also limited as to the price they may charge, and it was felt that circumstances might arise, as they have arisen, under which those limitations would press with peculiar hardship; but this plan, while protecting most fully the gas companies, has outraged the sense of justice of their customers, and has therefore produced results that may be disastrous to both parties. The revision clauses of these Acts of Parliament practically say to the gas companies: "You may call up and spend your capital as lavishly as you please, and if your price will not enable you to pay your full dividends, you can apply to the Board of Trade, who will appoint commissioners who must authorize you to raise the price sufficiently to cover the deficiency;" and the same applies to management.

Let me carefully guard myself against the thought that I am saying, or wish to say, one word against the gas companies or any one connected with them. I do not say either that capital expenditure has been excessive, or that management expenses have been extravagant; all that I say is that the present system is a direct incentive in that direction, and that it takes away all motive or encouragement to economize, and may thus in the end be productive of great injury to all concerned.

It is precisely in the opposite direction that the law regulating gas companies

should act. It ought to be possible to frame a scheme, to be embodied in a general Act, that should cause the interests of gas companies and their customers to run side by side—to make the consumers, in a sense, partners in the gas company—whereby both should participate in any improved or more economical working, giving the companies a slightly increased dividend for every reduction in price below a certain minimum standard, and, to be perfectly fair, the companies would have to submit to a reduction of dividend if their price exceeded a maximum limit. It would be unsatisfactory to fix an exact figure, and permit full dividends at such a price, with more or less for every variation from it; but to allow a range of, say, 1s., would give companies a chance when unexpected difficulties arose, and, moreover, would give them something to work for in the other direction. Suppose a company to be charging 4s. for its gas, then, if the price went beyond 4s. 6d., there would be a reduction of dividend; and, on the other hand, the company might, by reducing below 3s. 6d., obtain an increased dividend. I throw this out more as an illustration than a suggestion, for there are several plans whereby the object might be attained; and I hold it to be most strongly to the interest of gas shareholders, directors, and managers to heartily assist in carrying out some system whereby they may have their customers with them, some easily workable self-acting arrangement that would put an end to the cat-and-dog life, and make them live and work in peace with each other. In fact make it really to the interest of gas companies and gas managers to do the best they can for the consumers.

I have ventured on this dangerous ground, running the risk of being misunderstood, and possibly offending for a time some of my friends, because I am most strongly desirous of consolidating and maintaining the gas companies in existence; and I fear, unless some alteration is made, the tide of opposition will run so fiercely against them that in a few years independent gas companies will have ceased to exist, having been absorbed by the local authorities, which will not be in many respects to the advantage of the consumers, for there will remain all the evils of a monopoly practically without any control, and many of those who are such advocates for the transfer will, when too late, find their lot under the gas companies was preferable.

To maintain our position a first essential is the careful expenditure of capital. It is now recognized that it is not right to extend out of revenue, but there is danger of going to the other extreme. To check this a very good plan is to act on the principle that all increase in the demand for gas should yield sufficient profit to pay interest on the outlay of capital thereby rendered necessary, so that under all ordinary circumstances the outlay on extensions should not require an increase of price. Therefore, take a certain standard of capital per ton of coals, or per 1000 feet of gas, and endeavour year by year so to arrange that the expenditure on new plant does not exceed that proportion. I think this outlay on new work may in most cases be kept within £5 per ton of coals carbonized in the year, and it should be so laid out, if possible, that it becomes almost immediately productive, though this rule cannot apply so closely where entirely new works are being built, but even then it is worth attention, and an effort should be made to keep below this limit.

Papers to be Read.

The papers to be read deal with very interesting and important subjects, and will probably afford food for useful discussions. It is not my intention to reveal in any way their contents, but, having some acquaintance with them, I can confidently recommend you to hear them read. The first on the list describes how stopped ascension-pipes may be avoided; the next, on "Purification," is, as might have been expected, a very full and, I may add, an able and exhaustive treatment of the subject. That on "Condensation" is written by a man whose success as a manager is a pledge that it will be well worth hearing. I expect something very interesting. The fourth, by the able secretary to the Phœnix Company, treats on a subject that gas managers would do well to consider. Attention to it may be the means of rendering the grumblers among the consumers on account of bad lights contented. The paper on "Meters" is the completion of that read some time ago. I need not tell you how thoroughly the writer deals with his subject, nor how much our power to pay dividends while charging a fair price for our gas depends on good meters. Mr. West's paper I have already alluded to, and Mr. Malam has discovered a means for preventing naphthaline, which he will describe. There should be a full audience to hear the paper on "Gasholders," which, with that on "Gasholder-Tanks," will be found to deal with most important subjects with great completeness, the writers having bestowed great pains on the preparation of the papers; and, lastly, we are to be favoured with a description of a new method of manufacturing cannel gas, from which we may expect to learn something. It will certainly not be the fault of the writers of the papers if our meetings are not interesting. It, therefore, only remains for the members to perform their part in carrying on the discussions profitably.

Gentlemen, my task, so far as this address is concerned, is ended, though not at all satisfactorily to myself. However, what I have written I have written, and I can truly say my desire has been to render service to the profession to which I belong, and to the interest with which I am so closely connected. I have now to thank you for your very patient hearing, and to ask your assistance in the duties that lie before me—assistance that will certainly be granted, and without which I could not venture to undertake the responsibilities of the post. Let us take care that every paper is read and fully discussed, and that no one shall even have a thought that possibly circumstances have prevented his having had fair play. Our object is not merely to gain information, but to give it. In that spirit let us act. Not only here but everywhere our mutual respect and good feeling will be strengthened, and we shall look back upon this meeting as a stronger proof, if such be possible, of the pleasure and advantage of being members of the British Association of Gas Managers.

The reading of papers was then commenced. The first paper was by

Mr. W. J. Warner, of South Shields, on "Meters."

[We name the papers in the order in which they were read, reserving their publication, and the discussions thereon, for succeeding numbers.]

The morning sitting then closed.

The first paper read in the afternoon was by

Mr. J. Douglas, of Portsea, on "Gasholder-Tanks in Concrete."

Mr. C. Woodall, of the Phœnix Gas-Works, read a paper on "Gasholders,' and

Mr. John West, of Maidstone, read a paper on an "Improved Method and Apparatus for Manufacturing Gas."

These papers, and the discussions on them, occupied the whole of a long sitting.

In the evening a lecture was delivered by Mr. Etheridge, F.G.S., of the School of Mines, on "The Geology of Coal."

Wednesday, June 10.

The President took the chair this morning at eleven o'clock, and the proceedings of the day commenced with a reply by Mr. West to the remarks made upon his paper on the previous afternoon.

The first paper read was by

Mr. G. Anderson, of London, on "Purification." The reading and discussion of this paper occupied the whole of the sitting.

In the afternoon, Mr. G. D. Malam, of Halifax, read a paper on "The Retention of Naphthaline."

Mr. James Watson read a paper on "Condensation and its Effects in the Retention of Naphthaline." These two papers were discussed together.

Mr. Hodgson Jones, of London, read a paper on "Vincent's Patent Gratings applied to Gas-Retorts."

The President read a paper prepared by Mr. Isaac A. Crookenden, of the Phœnix Gas-Works, on "The Desirability of Companies Extending their Control to the Point of Consumption."

Mr. G. D. Malam read a paper on "Mr. Abraham Malam's New Process for Manufacturing Cannel Gas."

At the close of this part of the proceedings,

The President said: It is my pleasing duty now to move a vote of thanks to those gentlemen who have prepared papers to be read at these meetings. We have had some exceedingly interesting papers this year, and the gentlemen who have prepared them evidently bestowed a great amount of time and labour upon them, not only in writing them, but in getting together the information and the illustrative drawings. The very least, therefore, that we can do is to express to them, in the heartiest manner, our appreciation of their kindness, and our thanks for the information with which they have favoured us, and which has led to highly interesting and instructive discussions. I believe that when we come to read the transactions of these meetings, we shall find that we have been put in possession of a large amount of valuable and practically useful information for our future guidance. I therefore move that the best thanks of the meeting be given to the readers of the papers.

The motion was put, and carried unanimously.

Election of Officers.

The Secretary read the report of the scrutineers as to the result of their examination of the ballot papers, from which it appeared that the following gentlemen had been elected as officers, &c., for the ensuing year:—

President.—Mr. James Paterson.

Vice-Presidents.—Mr T. N. Kirkham, Mr. R. Morton, and Mr. W. Foulis.

Treasurer.—Mr. Henry Newall.

Committee (new members to replace those going off by rotation).—Mr. Longworth, Mr. Hunt, and Mr. Burgess.

Finance Committee.—Mr. G. Livesey, Mr. Jabez Church, and Mr. G. W. Stevenson.

Auditors.—Mr. Leather and Mr. Hersee.

Secretary.—Mr. W. H. Bennett.

Payment of Travelling Expenses of the Committee.

The President: We now come to a rather importannt matter, which somehow or other slipped through last year. It is felt to be unfair to call upon gentlemen to travel great distances to attend the committee meetings of the association. There is only one such committee, held in the month of April, and those who attend it have hitherto had to bear their own expenses. A resolution was passed last year, which should have been brought on for confirmation, authorizing the committee to pay the travelling expenses of their members.

The Secretary read the resolution, which, on the motion of the President was unanimously approved and confirmed, as follows:—"That the association sanction the payment of the travelling expenses of the members of the committee whenever they attend committee meetings other than those meetings immediately preceding the annual general meeting of the association."

Time and Place of next Meeting.

The President: Now we come to a knotty point—viz., to determine when and where our next annual meeting shall be held.

Mr. Hunter (Rochdale) proposed that the next meeting be held at Manchester.

Mr. Garnett (Ryde) proposed that it should be held at Newcastle-on-Tyne.

Mr. Woodall (Burslem) named Bath.

Mr. Warner (South Shields) named Bristol.

A Member suggested Paris, and

Mr. Broadhead (Grimsby), for the ninth time, proposed that the meeting should be held in Leeds.

On the first show of hands the numbers were as follows:—For Manchester, 15; Newcastle, 29; Bath, 3; Bristol, 34; Leeds, 56; and Paris, 21.

The two towns receiving the highest number of votes were then selected, and a second show of hands taken, when there appeared—for Bristol, 66; and for Leeds, 68.

The next annual meeting of the association will accordingly be held in Leeds.

The time fixed for the next meeting is the second Tuesday in June, 1875.

Compliment to the late Secretary.

The President: We have had the pleasure of seeing amongst us at the present meeting a gentleman who has been a stranger for the last five years, but who is well known and much respected by us all. I refer to Mr. James Blackburn, our first secretary, who has been absent from this country during the period I have mentioned. It has been thought by the committee that, on this occasion, we might pay that gentleman a compliment, and show to him that we have not forgotten the great services he rendered to the association at its starting. It is proposed that he should be elected an honorary member of the association. (Cheers.) I have no doubt that the proposition which I now make will be carried by acclamation.

The motion was heartily and unanimously adopted.

Mr. Blackburn, who was received with loud applause, said: Mr. President and Gentlemen,—I am sure you will give me credit for sincerity when I say that I thank you most heartily for the great honour you have just done me in electing me an honorary member of this association. It is five years and a half ago since, just prior to my departure for Calcutta, the members of the association presented me with a very useful and most substantial recognition of the few services I had been able to render them in my capacity of honorary secretary. This additional proof of your kindness and approval is a compliment which I trust I can appreciate to the fullest extent, for it is one of the highest honours which the association can bestow on any one. It is a pleasure to me to be present amongst you once again. I have been looking forward to this occasion for the last 12 months, and have timed my visit to this country with the view of attending this meeting. I feel proud of the success the association has achieved during the last few years; and when I see the great additions which have been made to its numbers and its influence, I think there can be no doubt that the intentions of its founders have been even more than realized.

Thanks to the Council and Secretary of the Society of Arts.

The President: I have now the pleasure to propose a vote of thanks to the Council of the Society of Arts, for their kindness in granting us the use of this room on this occasion, as they have cheerfully done in past years, when our meetings have been held in London. And, in proposing this vote, I couple with the council the name of their excellent secretary, Mr. P. Le Neve Foster, to whose courtesy we are also indebted for the necessary arrangements for our reception.

The motion was put and cordially agreed to.

Mr. Paterson, the newly-elected president for the ensuing year, said: Gentlemen, I cannot but rise to thank you for the very high honour you have been pleased to confer upon me by electing me to the office of president of your association. Had I consulted my own feelings in the matter, I should certainly have declined to allow my name to be brought forward, for I feel myself quite unworthy of this privilege, and I should have preferred to see some gentleman called to this important post whose name and position would have reflected higher honour upon the society than anything attaching to me can do. I cannot, however, conceal from myself the fact that, through me, you have been pleased to convey a very delicate compliment to those few gentlemen who, about 11 years ago, met in Manchester, and inaugurated what now forms one of the most important of the learned societies of this country—the British Association of Gas Managers. It is entirely upon this ground I venture to accept this honour, and, in doing so, I cheerfully undertake all the responsibilities which attach themselves to it. (Cheers.)

THANKS TO THE TREASURER.

On the motion of Mr. MAGNUS OHREN, the thanks of the meeting were voted to the treasurer for the services rendered by him to the association.

Mr. NEWALL, in a few appropriate observations, acknowledged the compliment.

THANKS TO THE COMMITTEE.

Mr. HODGSON JONES proposed a hearty vote of thanks to the members of the committee, which was cordially agreed to.

THANKS TO THE PRESIDENT AND SECRETARY.

Mr. C. WOODALL: Gentlemen, this is not the first time in our history that the most important business has been left to the last. I assure you that I esteem it a great honour and privilege to be allowed on this occasion to propose a vote of thanks to our president. (Cheers.) That this society has proved a great success is evidenced by the meetings held this year. A considerable portion of that success has been due to the character of the men of eminence who have occupied the chair at its annual gatherings, and we shall all readily admit that, in being presided over as it has been during the last two days by Mr. Livesey, it has not suffered in any respect. In proposing a vote of thanks to him, I need hardly remind you that all who come in contact with him claim and recognize him at once as a personal friend. For myself, I can truly say that there is no one whose personal friendship I more highly esteem, and I am sure that all present entertain for him the greatest respect and regard. I will only just refer to the admirable inaugural address which he delivered yesterday. That address has been the subject of remark amongst us all, and I have heard but one sentiment expressed in respect to it—that its courage, its truth, its ability, and its adaptation to subjects of the highest interest to gas managers, place it in a prominent position amongst the many able addresses which from time to time have been delivered before the members of this association. Gentlemen, I propose a vote of thanks to the president for his able conduct in the chair, and for the admirable address which he delivered on this occasion. (Cheers.)

The vote having been carried by acclamation,

The PRESIDENT rose and said: Gentlemen, I feel it due to you that I should at once and very warmly acknowledge the vote of thanks which you have just given me. I regard it as no small matter that that vote was proposed by a personal friend, such as Mr. Woodall; but I could not have expected that he or any one else would have spoken of me or my services in such flattering terms. I thank him sincerely for the kindness which prompted him thus to speak, and which beamed in every word he uttered. I have certainly done what I could to promote the prosperity of this association, and in occupying this chair I have had but one object in view—that object being to endeavour to deal fairly with all parties. (Hear, hear.) Possibly I may not have succeeded in every case; but I can only assure you that if I have failed it has been unintentional on my part. I have been anxious that every person should have the fullest opportunity to speak and to be heard on all points. I am, as you know, deeply interested in the success and prosperity of gas companies, and anything that tends to secure those objects has my warmest and most hearty approval. In the course of the proceedings in connexion with these meetings, that which has specially pleased me has been the kind, cordial, and generous manner in which you have acted towards me. I feel that to preside over a body of men such as the British Association of Gas Managers is a great honour, and that the responsibilities attaching to it are very much lightened and relieved by the good feeling and sound, practical sense manifested by all the members at these annual meetings. My duties in this chair have been of the easiest and most pleasant description, and for that I am indebted to your kindness and great consideration. I trust this association may prosper in the future as it has done in the past, and I can only add that I am glad Mr. Paterson has been elected president for the coming year. (Cheers.) Before, however, I sit down, I have a duty to perform which must on no account be neglected. There is a gentleman present to whom we are much indebted for the success of this institution, and upon whom a large amount of work in connexion with it devolves. I allude to our excellent secretary, Mr. Bennett. As president, I have formed some opinion of the amount of work and labour which fall to the lot of the secretary, and I can only say, I feel that any remuneration we may give him will not compensate for the time and attention which he is necessarily called upon to bestow upon the duties of his office. But I know that his heart is in the work, and that he feels a pleasure in the discharge of those duties. I propose that we give him a cordial vote of thanks on the present occasion.

The vote was carried amidst loud cheers.

Mr. BENNETT said: I thank you, sir, for the very kind expressions in which you have been so good as to move a vote of thanks to me, and I thank the members of the association present for the hearty manner in which they have responded to the proposition. The duties which, as secretary, devolve upon me to perform, afford me a great deal of pleasure, especially when I am assisted, as I have been this year, by a most able committee and a most considerate president. If the services I have been able to render the association meet with your approval, I can assure you it is a great satisfaction to me to hear it.

The business sittings were then brought to a close.

In the evening the members and friends of the association dined together at the City Terminus Hotel, Cannon Street—Mr. Livesey occupying the chair, the vice-chair being filled by Mr. Paterson.

After dinner the usual loyal and patriotic toasts were given, the chairman, who is a teetotaller, of course drinking water only. Some excellent speeches were made by the chairman, Mr. Fraser, Mr. Vernon Harcourt, Mr. H. P. Spice, Mr. Garnett, and others, and the entertainment was enlivened by music and song.

THURSDAY, JUNE 11.

This morning an excursion was made by steamboat to Woolwich, to inspect the Royal Arsenal, for which special arrangements had been made, with the sanction of the War Department. After spending some hours in visiting the various workshops and stores, the company, consisting of nearly 300 persons, crossed the river to North Woolwich, where an excellent cold collation was provided for them by the committee in the Pavilion grounds. Having done full justice to the hospitality of their hosts, the members and friends returned to the Arsenal, where, in the Royal Gun Factory, they had the opportunity of witnessing the coiling of a large gun, and some heavy forgings with the newly-erected and gigantic steam hammer. By the kindness of Mr. Abel, F.R.S., chief of the Chemical Department, Royal Arsenal, arrangements had been made at the gas-works to demonstrate to the members the heat of the interior of a retort by means of Siemens's Electric Pyrometer. Mr. R. O. Brown was in attendance, for the purpose of conducting the operations; but the fact probably was not generally known to the members, who might have been pleased to see an experiment which few, if any, amongst their number have had the opportunity of witnessing. At five o'clock the party re-embarked for London, having spent a most enjoyable and by no means unprofitable day.

The whole of the arrangements in connexion with these meetings of the association were carried out in a very admirable manner, and reflect the highest credit upon the committee and secretary, whose efforts contributed materially to render this annual gathering a great success.

BANQUET AT THE CRYSTAL PALACE.—The Gas-Meter Company, Limited, availing themselves of the presence in London of a large number of provincial directors and managers, issued invitations to them and other friends for a banquet at the Crystal Palace on Friday evening last. The entertainment was given in the Grand Saloon, where a numerous assemblage met to enjoy the luxurious hospitality of the directors. The saloon was profusely decorated with plate, vases, and flowers, and the dinner was served in the most *recherché* style. Mr. W. W. Andrews, the able and esteemed manager of the company, occupied the chair. A military band, stationed in the gallery, performed during the dinner, and the speeches in the evening were interspersed with a selection of vocal music, the arrangements for which were under the direction of Mr. Ransford. The loyal toasts having been drunk, the chairman proposed "The Army, Navy, and Auxiliary Forces," which was responded to by Captain Allen and Adjutant Garnett. The next toast was "The British Association of Gas Managers," to which Mr. Jabez Church, one of the past presidents, responded. Mr. Laing, engineer of the Independent Gas Company, proposed "The Directors of Gas Companies," and Mr. H. P. Stephenson responded. Mr. Wood, of Bury, gave "The London Gas Engineers," a toast which Mr. H. Jones, of the Ratcliff Gas Company, acknowledged. Mr. Jabez Church then proposed "Our Scottish Brethren," and in very complimentary terms referred to the generous hospitality manifested by them last year during the visit of the British Association to the northern capital. Mr. Fraser, of Inverkeithing, acknowledged the compliment. The toast of the evening, "Prosperity to our hosts, the Gas-Meter Company," was proposed by Mr. R. P. Spice. He spoke of the wisdom of the company in the selection of their manager, and remarked that, in addition to his ability as a man of business, Mr. Andrews had shown himself to be a most genial chairman. Mr. H. Brothers, with whose name the toast was associated, responded in appropriate terms; and Mr. Magnus Ohren then proposed the health of the chairman, which was drunk amidst loud cheers. The company then separated.

SANITARY CONDITION OF THE CITY OF LONDON.

[Extracted from Dr. Letheby's Twenty-fifth Annual Report.]

"It is gratifying to know that during the last 20 years there has been a marked decrease in the proportion of deaths in the City from zymotic diseases, the number having declined from rather more than 5 per 1000 of the population to less than 4. In the following table I have represented the average annual proportion of deaths from the most important zymotic diseases during each of the four quinquennial periods of that time, and you will notice that from a proportion of 200 per 1000 of the deaths in the first of these periods, it has fallen to 160 per 1000 in the last.

Average Annual Number of Deaths from Zymotic Diseases in each of the Four Quinquennial Periods of the last Twenty Years.

Zymotic Diseases.	Quinquennial Periods from			
	1854 to 1858.	1859 to 1863.	1864 to 1868.	1868 to 1873.
Alvine disorders of . . { infants . .	77	60	74	45
{ adults . .	49	23	41	12
Continued fever	121	108	97	45
Scarlet fever	110	115	65	64
Small-pox.	28	32	21	24
Measles	68	89	61	33
Whooping cough, croup, &c.	149	165	114	77
Totals	602	592	473	300
Proportion per 1000 deaths.	200	210	192	160
„ „ living	5·00	5·17	4·95	3·91

"The most noteworthy of these reductions is in the case of continued fever, which has steadily declined from an average of 121 deaths in the year to only 45, the successive number for each of the quinquennial periods being 121, 108, 97, and 45. Going back, however, to a later date, I find that the reduction has been still more marked; for in the seven years which preceded my term of office the average number of deaths in the City from continued fever was 140 per annum, whereas in the last seven years it has averaged but 53 per annum, and during the last three years only 28. In the first of these periods the proportion amounted to 44 per 1000 of all the deaths, in the second it was hardly 27 per 1000, and in the third it was only 16. Now, as fever is the invariable concomitant of defective sanitary conditions, occurring in those localities which are stigmatized as unhealthy, it is manifest that the falling off in the mortality from it is the fruit of your sanitary labours, and so also is the notable reduction of the annual number of deaths from diarrhœa."

In concluding his report, Dr. Letheby takes a retrospect of the sanitary work in the City during the time he has fulfilled the duties of medical officer of health:—

"It will be seen from this that the sanitary duties of the City are very multifarious, and that they have largely increased since I had the honour of being elected your medical officer of health, for it has devolved on me to co-ordinate the duties of my office, and to extend them as occasion arose. It has also been my duty to advise and report to you on a multitude of sanitary subjects, as—The condition of the graveyards and church vaults of the City; the imperfection of mortality returns; the state of the water supply and quality of the water drawn from the City pumps; the condition of the sewers, as regards the nature of sewage, sewer gases, &c., and the means of ventilation; the condition of the slaughter-houses and cow-houses of the City, and many other such cognate matters, all of which have been the subjects of special reports, which have, in most cases, had a wider application than was originally intended, from the circumstance that the sanitary practice and experience of the City have often been accepted as the standard for comparison. This is a gratifying recognition of the value of our sanitary labours, and I allude to it in order that I may, in this, the last act of my present official connexion with the City, thank you for the assistance and encouragement which you have invariably afforded me in the discharge of my onerous and important duties."

PURIFICATION OF COAL GAS BY MEANS OF THE BOG-IRON ORE OF BUDIN.

By MORITZ VOLLMAR.

This ore is found some miles south of Teplitz, in Bohemia, and has for some years been sold by the peasants as ochre. It contains on the average 70 to 80 per cent of ferric hydrate. After being treated with ½ to 1 per cent. of lime, best in the form of milk of lime, it may be used with great advantage for the purification of coal gas. The ordinary purifying agent, consisting of 100 parts of iron sulphate ignited with 25 parts of caustic lime, costs about 3s. 3d. per cwt. This iron ore can be supplied at Raudnitz at 1s. per cwt., and being twice as rich in iron oxide, may be predicted to have twice as much purifying capacity. After being saturated with sulphur, it may be dried and ground to a fine powder, which admits of the following uses:—Mixed with an equal weight of iron filings, it forms a cement with water or crude glycerine, which hardens after 24 hours, and may be used for joining wood, iron, or stone. If fused with half its weight of sulphur, it may also be used as a cement. This compound dissolves in boiling paraffin oil, and the solution may be used in the same manner as pitch or asphalte for covering roofs, &c.; it is not more inflammable than the ordinary material. The author proposes to name this substance *Sidrothion* (from σιδηρος, iron, and θειον, sulphur).—*Journal Chemical Society.*

METROPOLIS GAS SUPPLY.

South London Gas Consumers Protection Society.

DEPUTATION TO THE BOARD OF TRADE.

On Thursday last a Deputation from the South London Gas Consumers Protection Society had an interview by appointment with Sir Charles Adderley, M.P., President of the Board of Trade, in one of the ante-rooms of the House of Commons.

The deputation was introduced by Mr. Boord, M.P. for Greenwich, who said the object sought by the society was a remedy of the grievances to which the consumers of gas in the metropolis were subject with reference to the quality and price of gas, arising out of the practical monopoly possessed by the gas companies. The members of this society felt that the consumers ought to have some power of interfering in such a manner with the gas companies as should ensure the economical manufacture of gas, and make the companies supply a better article for the money. They had no desire to interfere with the dividends of the companies, and the suggestion which they had to offer appeared to him of sufficient merit to justify him in seeking this interview for the deputation. Of course he did not commit himself in any way to the suggestion which would be made, but it was perhaps worthy of being considered by the Government with a view to the supply of a remedy.

Mr. Norwood Earle then proceeded to state in detail the object of the deputation. He said the gentlemen present represented a society which had been formed for the purpose of securing a remedy of grievances of which gas consumers complained. He had been called in, as a gas engineer, to give advice as to some practical plan: he had submitted one, and he would, with permission, lay it before the President. The consumers were prejudicially affected by the exclusive powers conferred on gas companies, which shut out anything like competition, and they possessed no sufficient means of redress for any injustice towards them on the part of the companies. It appeared from the gas referees report that the referees themselves had no power to enter into the question of capital raised and expended by the companies. The companies could raise whatever they liked, and the consumers were, nevertheless, bound to pay a price which would allow the companies to pay their statutory dividend. The consumers in that direction had absolutely no redress.

Sir Charles Adderley asked if the power of the referees was so restricted.

Mr. Earle said it was so. They could not inquire into the capital, how raised or how expended; and, besides this, they had only power to deal with three of the companies in the metropolis. The others were under no check whatever. Parliament had sanctioned the division of the metropolis into districts, the advantage of which was that the frequent opening of the streets by competing companies was prevented; but it had this great drawback, it prevented the consumers reaping the benefits which would result from healthy competition, which was a great grievance. The south of London was supplied partly by the South Metropolitan and partly by the Phœnix; and, as an illustration of what he had just said, he might add that, in the Brixton Road, the South Metropolitan were supplying one side of the road and the Phœnix the other, the consequence being that gentlemen on one side were paying 4s. 6d. per 1000 feet and a meter-rent for their gas, whilst those on the opposite side were only paying 3s. for quite as good gas, and with no meter-rent. Not only did Parliament enable this to be done, but it went further, and said to the consumers who were paying the highest price, "You shall not have the other gas though the main passes your very door." In this respect, therefore, Parliament was not only permitting a grievance, but enacting one. Various remedies had been suggested to meet the evil. Gas referees had been appointed, but, inasmuch as their functions were limited to the concerns of three only of the companies, there was in their appointment no sufficient means of redress. Then it was proposed that the Metropolitan Board should buy up the whole of the companies. The deputation, however, were not in favour of this being done, because, in the first place, the amount necessary to buy up the companies interests would be enormous; in fact, it had been estimated at something like £25,000,000. If the Metropolitan Board had to pay such a price it would be impossible for them to give the consumers good and cheap gas. The deputation were not present to say one word against the gas companies; in fact, they thought perhaps the consumers had rather injured their case by what had been already said. They were not desirous of the gas supply being taken out of the hands of the gas companies, who, with the long experience they had, ought to be the best parties to deal with it; but what the consumers did desire was, that if the companies had the monopoly, there should be power to regulate it, and that the consumers should have redress for grievances that might arise. With regard to the gas question and the vestries, it had been said that vestries should be authorized to make the gas for their respective district; but the whole tendency of legislation at the present time seemed to be to remove gas-works as far away from crowded places as possible; and besides this, it was not expedient that the functions of vestrymen should be extended to the manufacture of gas. It was, then, a question as to what remedy should be proposed? The suggestion which the deputation had to make was that the gas companies of the metropolis should be dealt with by the Government in an Act similar to the Railway and Canal Traffic Act, cap. 48 of last year; that there should be the same control over the gas companies as was now exercised over the railway companies; that for this purpose permanent commissioners should be appointed —persons of experience in gas matters and business generally, who should fix the price to private consumers and local authorities, sanctioning contracts in accordance with facts proved, hearing consumers either personally or by counsel, disallowing everything that needlessly increased the prime price of gas, and granting such a price to the companies as would secure their dividends and insurance-fund when they secured equal results to the maximum obtained by the best of other companies. The engineer of the South Metropolitan Company had been asked how it was that they could supply gas at 3s. 6d. per 1000 feet of the same quality as other companies were charging considerably more for, and he had shown that it was really a matter of management. The directors fees were smaller, the staff was small but efficient, they got more out of a ton of coals than the other companies did, and they obtained the highest price for the residuals—in fact, it was just the difference between doing a business in a good way and in a bad way. What the deputation wished strongly to enforce upon the Government was that they ought not to be compelled to pay for bad management on the part of the companies; that the companies should have the same responsibility resting upon them as private traders—to work in the best way possible. Such a thing as a strike was, perhaps, an exception, and the consumers, no doubt, would not object to pay a trifle extra in a case of that kind; but if an official ran away with large sums of money, or the company failed to get as much out of a ton of coals as they ought, the penalty ought to come out of the dividends of the shareholders, and not out of the pockets of the consumers. If something were not done in this direction, gas companies, as at present, would feel that it mattered but little what bad results came about through their mismanagement, as they could fall back upon an increased price. On the other hand, if the dividend was made to suffer from bad management, the companies would be anxious to produce the best results, or they would be afraid of the consumers going before the commissioners. The Railway Commissioners were very serviceable, and to show how acceptable it was he referred to the case of *Goddard v. The South-Western Railway Company*, where the complainant had a grievance against the company in respect to their not giving him proper charges and proper powers.

Sir C. Adderley: Facilities you mean, as they could not deal with charges.

Mr. Earle said, whatever the exact grievance was, he managed to gain five points out of six of his case, and it only cost him £3 5*s*. He could not see why something of the same kind should not be provided for the protection of the gas consumers. The plan proposed would not confiscate the gas company's property; it would not limit their dividends; it would not transfer their undertakings to other hands, but would simply provide a more equitable means of redress for any injustice to the consumer. The effect of such a controlling power would be to induce the companies to employ better means in the manufacture of gas, and the consumers would probably get it at 3s. or 3s. 6d. per 1000 feet; whilst the dividends would not be affected. It was not a local grievance, although the deputation on this occasion were chiefly from South London. Everywhere the public were complaining that they had not proper means of redress as against the gas companies. What was now proposed as a remedy he thought was only fair and equitable, and the deputation would feel deeply indebted if Sir Charles Adderley would give the plan his consideration, and point out anything erroneous in what had been stated.

Mr. A. Dunn remarked that when a deputation attended the President on a recent occasion it was suggested that there were no means of remedying the matter except by the Government purchasing the whole of the companies, but he thought the scheme which had been explained by Mr. Earle was the proper one to adopt, being fair and equitable to all parties. There was reason to believe that at the present time there was a great deal of waste and mismanagement in gas manufacture; but if such a plan was adopted as had now been proposed, by which the companies would be made responsible for bad management and carelessness, it would induce them to exercise more care, and the public would be satisfied in being able to make their grievances known, and so get them redressed.

Mr. Featherstone, in illustration of the grievance complained of, said that in Greenwich, which he represented, the Phœnix had increased their charge for the public lamps from £4 5*s*. to £4 15*s*. per annum, whereas the South Metropolitan Company, in their district, charged only £3 per lamp.

Mr. Kimber said the proposition submitted by Mr. Earle had been well considered by the society, and they believed that nothing more equitable could be proposed.

Mr. Earle said some provision ought to be made so as to ensure the quality of the gas being delivered to the consumer of the required standard.

The President, having listened to the various statements made to him, said all that he could now do would be to promise that they should receive due consideration. No doubt the consumers had a good deal to wish for. It was hard to say how far Parliament was to blame for the way in which the metropolis had been districted amongst the gas companies. It was like, however, a great many things—if it could have been foreseen what would occur in the future, probably a much better system might have been adopted; and it would, perhaps, have been better if from the first public bodies had taken up the matter of the supply of gas instead of the companies, which, as in the case of water supply, would be much better in the hands of corporate bodies than in those of private companies. He believed a great deal of the extra price charged for gas in different parts of London arose from the inconvenient way in which those districts had been laid out. It was necessarily more expensive to serve distant districts than those more centrally situated. With regard to the Metropolitan Board of Works purchasing the companies, he had never heard before now any estimate of the cost of doing this; but there could be no doubt but that they would purchase to a great disadvantage. Putting that, however, out of the question, it was a matter for consideration what remedy could be given at this moment. And this was indeed a most difficult question, because of the powers and guarantees given to the companies by their Acts. He did not think the Railway Commission was analogous to what was desired as between the consumers and the gas companies. The Railway Commission could not interfere with charges; they could only deal with facilities. In fact, the Railway Commission was simply a substitute for the Court of Common Pleas, as a judicial body, to decide on questions and complaints brought before them of the railway companies having contravened the Acts of 1854. They could not deal with questions of rates; and when Mr. Wait, the member for Gloucester, a few days ago had proposed a clause to enable them to deal with rates, it was immediately rejected by the House as an inadmissible thing, and the report of the Railway Commission was against it. The section to which reference had been made by the deputation—viz., that which enabled the Board of Trade to appoint commissioners—seemed to be the line pointed out by Parliament. It was stated by the deputation that that power was limited to three companies, and also that they could not go into the question of capital. It was therefore a question whether that particular provision could be extended so as to give the additional power which it was thought was required. He was not prepared to say whether this could or could not be done, but he would consider the matter. At any rate, it appeared to be the only mode in which the consumers could secure any check at present with reference to unequal or excessive charges. With respect to larger remedies, it was difficult to deal with them, so many rights had been guaranteed to the companies by Act of Parliament. He was glad to find the consumers had such an influential body to look after their interests, but he did not think a commission such as had been suggested would do any good, as there was no analogy between such a commission and the Railway Commission—in fact, he did not see how such a commission could be formed.

Mr. Earle said the consumers would be contented if such a commission was appointed to see that the companies carried out their obligations with due care and proper management, and that the consumers had only to pay a proper price for gas.

The President said it was difficult to say what was mismanagement. The increase in the charge for gas in some cases was due to the dearness of coals.

Mr. Earle said when two or three companies were getting good results as compared with other companies, there appeared to be a good ground for some power of revision.

The President said it seemed to him that the only mode Parliament had indicated in the case of the public for the grievance complained of was to extend the powers of the referees appointed by the Board of Trade.

Mr. Earle said the consumers desired that there should be some control exercised over the charges.

Sir Charles Adderley: That is a very wide word—control. I think it will be for you to consider how far the provision to which I have referred can be extended, as that seems to be the mode indicated by Parliament by which the public shall obtain redress. Of course I cannot express any opinion on the matter myself; at the same time, I do not think a commission similar to the railway commission would do.

After some further conversation, the deputation thanked the president for the kind reception given to them, and retired.

Delegate Meeting in St. Pancras.—On Tuesday last a meeting of representatives of various vestries and district boards in the metropolis was held, on the invitation of the St. Pancras Vestry, in the vestry-hall of that parish—Mr. J. Hoppey in the chair—to discuss the present state of the question of gas supply. There were present delegates from Poplar, Hackney, Greenwich, Islington, Holborn, Shoreditch, Bethnal Green, St. Martin-in-the-Field, Lambeth, Whitechapel, St. Marylebone, Bermondsey, St. James's, Kensington, St. Olave's, St. Paul (Deptford) St. Pancras, Newington, and St. Giles. The chairman introduced the proceedings by remarking that many of the vestries and district boards had passed resolutions deprecatory of the recent increase of the price of gas, but the St. Pancras Vestry thought it would be more advisable for them all to co-operate in their efforts to obtain a reduction. That was the reason why the present meeting had been convened, and he hoped that their deliberation would tend to the welfare of the gas consumers. The first and only resolution adopted

was—"That the increased price of gas shows that it is desirable that the local authorities of the metropolis should have a further control over the metropolitan gas companies, with a view to the better protection of the interests of the gas consumers." A resolution was next proposed to the effect "That in the opinion of this meeting it would not be wise to entertain the idea of purchasing the interests of the gas companies, but to petition Parliament to allow other companies that may be formed to compete in those districts which the present companies have so unjustly monopolized." To this proposal an amendment was moved by Professor Marks (St. Marylebone)—"That with a view to giving a practical effect to the foregoing resolution, this meeting, representing the united vestries of the metropolis, call upon the Metropolitan Board of Works, before whom the entire gas question has recently been brought, to consider the best means to be resorted to in order to combat the gas monopoly, and to communicate its determination to this board of delegates." He said that although they came there to endeavour to pull down the gas monopoly, yet it had been proposed to put the sword in the hands of the gas companies to inflict still greater wounds. He judged the future by the past. What had been the result when several companies had been in competition? Why they had coalesced. Competition was, therefore, impracticable. Why should gas, which was almost as important a commodity as water, be in the hands of monopolists? The question was too complicated to be considered at this meeting, and he therefore hoped the amendment would be agreed to. Mr. Wilson seconded the amendment. Mr. Firth urged that several of the provincial towns had set an example which London might well follow. With regard to Professor Marks's proposal, he would remark that in 1870 the Board of Trade wished the Metropolitan Board of Works to take up the matter, and they had declined. It was his opinion that the Board of Works was overworked, and that the matter ought to be taken up by the united parishes. Mr. Westacott said he could support neither the motion nor the amendment. What was wanted was an independent inquiry. The Imperial Company had erected works at Bow, large enough to supply four times the gas that was necessary at the present time, and the consumers had to pay 10 per cent. on the outlay for those premises, which would not be wanted for 10 or 20 years to come. He suggested that the larger parishes should manufacture their own gas, and that the smaller ones should unite for that purpose. A further discussion ensued, but eventually it was agreed that the consideration of the motion and amendment should be postponed, and that the conference should be adjourned till that day fortnight.

City of London.—At the Sewers Court, on Tuesday last, the Streets Committee brought up a report on the increased cost of gas supplied to the public lamps, in which they suggested that the time had arrived when the commission should seriously think of undertaking the cleaning of the lamps themselves. The question was referred back to the committee for further consideration and report.

Phœnix Gas Company.—The directors of this company announce a reduction in the price of gas from 4s. 6d. to 4s. 2d., to take effect from Midsummer next.

St. Marylebone Vestry.—At the meeting of this vestry, on Thursday last, Dr. Whitmore, in reply to an inquiry, said the low illuminating power of the gas which was complained of arose from defective burners, that were corroded or otherwise out of repair. The Imperial Company gave gas equal to 14 sperm candles, while that of the Chartered was usually equal to 16, the legal standard. The system of testing, which he carried out at the court-house daily, and which was originated by Dr. Letheby, he considered perfect. He would suggest that gas-fittings should be changed at least every other year. In reference to the public lamps, he remarked that the difference in the light yielded arose from the fact that in some districts there were 4 cubic feet an hour burnt, in others 5 feet. If the gas in tradesmen's shops and private houses were deficient in illuminating power, that was caused by bad burners.

Bermondsey.—A meeting of gas consumers was held in the vestry-hall of this parish on Tuesday last, at which a motion was proposed that a deputation be appointed to wait upon the directors of the Surrey Consumers Gas Company, asking for a reduction in the price of gas to the charge made by the South Metropolitan Company. After some discussion an amendment was moved to the effect that, as it would be of no use to send a deputation to the company, it would be better to form a committee of gas consumers, and draw up and present a memorial to the "West End Gas Consumers Vigilance Committee." The superiority of this amendment (probably from its vagueness) at once commended itself to the meeting, and the original motion was withdrawn in its favour.

METROPOLIS WATER SUPPLY.

Southwark and Vauxhall Water Company.—The half-yearly general meeting of the proprietors of this company was held at the office, Sumner Street, Southwark, on Thursday last—Mr. J. T. Carbonell in the chair. The following is the report of the directors presented on that occasion:—"The directors beg herewith to submit to the proprietors the half-yearly accounts of the company to Lady-day, 1874, which have been duly certified by the public auditor appointed by the Local Government Board, and by the auditors of the company. Since the directors last met you in general assembly the state and condition of the company's works has continued to be satisfactory. The extensive works which the company are constructing at Peckham and Hampton, in connexion with constant supply, are approaching completion, but considerable portions of mains have yet to be laid. The increase in the company's rental for the half year ending Lady-day last was at the rate of £5065 4s. 6d. per annum. The directors recommend that a half year's dividend, at the rate of 5½ per cent. per annum on the ordinary stock, class D and class G shares, at the rate of 5 per cent. per annum on the preference stock and on the amount paid on the preference shares, and at the rate of 4½ per cent. per annum on the ordinary shares, and on the instalments paid on the new ordinary No. 1 shares, be declared payable on the 15th of July."

Hydrants.—At the meeting of the Metropolitan Board, on Friday last, the Works and General Purposes Committee made a report, in which they recommended that the Kent Water-Works Company be informed, in reply to their letter of the 1st of May, 1874, relative to the works under this board's order of the 14th of November last, for giving a constant supply of water in Rotherhithe, that the board have placed 30 hydrants in position, and are not at present prepared to proceed further in the matter. The recommendation of the committee was agreed to.

THE PURIFICATION OF WATER.*

By Professor Gustav Bischof,
Professor of Technical Chemistry at the Andersonian University, Glasgow.

The observations and results of experiments which I beg leave to lay before you refer merely to water which is to be employed for domestic use, and not to the purification or utilization of sewage. Perhaps I ought to apologize for choosing this subject, which is not of immediate interest for those residing in Glasgow, as we are fortunate enough to have a water supply which requires no purification. However, this question is of grave importance to by far the majority of our fellow-creatures, who have no Loch Katrine, and whose water supply is derived from doubtful sources. We know that in 1852 an Act was passed for the more effectual filtration of water supplied to towns and cities. But this Act has not prevented one of the London companies (as admitted by their engineer, in an official inquiry in 1869) from distributing to the general district about one million gallons of tidal water, taken from the Thames at Battersea. It could not prevent, as we are informed by Dr. Frankland in his report of April 24, 1871, the collection of a mud to a depth of at least 2 feet at the bottom of a reservoir belonging to one of the companies. The coarser portions of this mud, after being thoroughly dried, were found to contain 13·72 per cent. of nitrogenous organic matter in a putrescent condition. A few months ago a case of typhoid fever with fatal result was traced from London to Leamington. An analysis of water of the latter town, made by Dr. Letheby on behalf of the local authorities, disclosed an excess of organic matter, which he reported might be possibly due to temporary floods.

These instances, which might have been multiplied by many more, will, I trust, be considered a sufficient excuse for bringing this subject before you. The impurities in water, to which the attention of the analytical and practical chemist should especially be directed, are suspended matter, dissolved fermentable organic matter, and certain mineral matter.

The purification of water can either be completed by water companies, or it may be wholly or partially effected by consumers in small domestic filters.

At present the only filtering medium extensively used by water companies is sand. Even by the most careful filtration of water through sand only suspended impurities can essentially be removed. The turbidity of water affords a test sufficient to decide the efficiency of such a mechanical filtration. The dissolved impurities are at present in practical working, beyond the control of any company, unless they can modify their water supply. I say, in practical working, because even by filtration through sand a chemical purification from dissolved impurities may be attained; but this would, according to Dr. Frankland's researches, require such a thickness of the filtering medium, or such an extremely slow filtration, that it is practically impossible.

While conversing with the engineer of one of the London water-works during a visit, it struck me that the sand, which, after being washed, is used over again for filtering, might be one of the causes of the apparent deterioration of water. The arrangement of these sand filters is well known. At the bottom of the tank constructed for the filter are placed layers of pebble stones, gradually decreasing in size until they come to the size of the coarse sharp sand which is placed on the top. When water is passed through such a filter, nearly all the suspended matter in it is deposited on the very top of the sand, where it gradually chokes the filter. The top sand and dirt is then removed by scraping off about half an inch of the surface. This surface sand or mud is washed with water. It falls from a tank, in which an upward current is produced by water entering at the bottom under pressure, through an inclined sieve, which retains the coarser impurities. From the sieve the sand falls on to an inclined trough, over which the water, which passes through the sieve, runs. The coarser particles of the sand are constantly worked back on the incline of the trough with a spade, while the finer particles and the mud are carried away with the water and run to waste. The sand thus recovered is used over again. I could not gather whether this washed sand had ever been analyzed for its purity; so I took a sample, which I was informed had been used over again some 20 times, and another sample of the same quality of sand, which, I was told, had never been used for filtration before. The result of my examination is satisfactory, showing that from this source no danger need be apprehended.

Both samples dried at 100° C. were heated to redness. The sample which had not been used, lost on heating 1·0 per cent.; and the sand which had been used even less—0·9 per cent. The former, on heating, exhibited the smell of sulphurous acid, but did not turn black; the latter, which had been used and washed, betrayed no smell of sulphurous acid, but turned black. Fifty grams of each sample were then mixed with ½ litre of Loch Katrine water, and frequently shaken during 24 hours. 100·000 parts of the extract of the sand which had not been used, filtered through paper, gave 0·41 free and 0·48 albuminoid ammonia; the other even less—0·31 free and 0·36 albuminoid. Nevertheless, considering the facts above alluded to, it may be questioned whether it is satisfactory to rely solely on the filtration of water through sand—at least if the source from which the water is derived is not above suspicion.

If we bear in mind that London alone requires some 110 million gallons in 24 hours, it is not easy to comprehend how a method could be discovered to deal efficiently and practically with such vast quantities. Moreover, considering the difficulties of any chemical purification on an extensive scale, it does not stand quite to reason that the water used for flushing water-closets and the like should be purified equally by the companies with the water used for drinking; and under any circumstances a chemical purification of the whole bulk of water by water companies would probably result in an *imperfect* purification. In the hands of consumers many plans may be practicable which would be utterly impracticable if applied to the large bulk the water company has to deal with; and the consumer can limit the purification to the comparatively small quantity required for culinary and drinking purposes.

Few plans only have been suggested, with any chance of success, for the chemical purification of water by water companies. Amongst these, Dr. Clark's softening process and Spencer's magnetic carbide process have been prominent. One of the advocates of the former process is Dr. Frankland, who explained, in the minutes of evidence taken before the select committee on Metropolis Water (No. 2) Bill (June 28, 1871), that Clark's process consists in mixing a certain quantity of milk of lime with the water as it is flowing into the reservoirs, and then allowing the mixture to subside for about 12 to 24 hours, passing it afterwards, in the case of river water, through the present sand filters. The effect of the process is to reduce the hardness of the water to about one-fourth of what it was previously, and to reduce the proportion of organic matter, according to Dr. Frankland, to less than one-ninth, and the total solid impurity (or residue, in the ordinary way of speaking) to considerably less than one-half. Dr. Frankland attributed the purifying action of Clark's process to a surface attraction. The very fine precipitated chalk, he argued, attaches itself to the organic matter—dyes itself, as it were, with it. The chalk that is thrown down from the Thames water is of a coffee colour, or nearly so, from the organic impurities which it carries down with it.

Taking for granted that the proportion of albuminoid ammonia resulting from a water, before and after softening, would give some indication of the ratio at which the organic matter is reduced through Clark's process, I recently softened a sample of the Southwark and Vauxhall Water Company's water, until turmeric paper gave just the faintest alkaline reaction. The conditions were then more favourable than they ought to be in practical working. The result was that the water contained in 100·000 parts—

	Before Softening.	After Softening.
Albuminoid ammonia	0·0307	0·0229

It will be seen from these figures that the albuminoid was reduced some 25 per cent.

Clark's plan has been tried, on a limited scale, by several water-works; but the only localities, as far as I can gather, where it is, or at least was in 1871, in use are Tring and Caterham, two small places.

With this evidence before us it is difficult to see why this process, which appears to offer considerable advantages, has not met with more universal favour. If I may venture an opinion, a great drawback in working this process on an extensive scale is the difficulty of storing for an additional 24 hours the immense volume of water required, a difficulty which would prove almost insuperable in the case of those London companies whose works are situated almost in the centre of the City. If the reservoirs for the treatment with, and the precipitation of, the lime were to be made shallow, an immense area would be required; and if they were to be made deep, the deposition would take proportionately longer.

Again, if the deposition in these reservoirs be incomplete, the precipitation of the finely divided calcium carbonate on the top of the present filtering-beds might seriously interfere with their working. I find some remarks bearing upon a similar question in an examination before the Judicial Committee of the Privy Council. Mr. Harper, the secretary of the Southport Water-Works Company, stated that after working Dr. Clark's process for nine months they found it

* A Paper read before the Philosophical Society of Glasgow.

was clogging up their pipes with a lime deposit, which rendered them useless, so that, in their case, it was a complete failure. It need not be remarked that for soft water, for instance—the Loch Katrine water—if it needed purification from organic matter, Clark's process would in no case be applicable.

The magnetic carbide process is the invention of Mr. Thomas Spencer. He prepares a porous magnetic oxide by mixing preferably the Cumberland hematite ore with a certain proportion of carbon, and heating the mixture at a dull red heat in retorts for 24 hours. The magnetic oxide produced is mixed with coarse sand when employed for filtering water, and it has on the top a layer of finer sand, some 3 inches thick, to intercept mechanical impurities, if such be present. Mr. Spencer states—and this is corroborated by the evidence of several witness—that a layer of from 6 to 12 inches of the magnetic material is generally sufficient to remove all organic impurities which are in a state of putrescence, while freshly dissolved organic matter takes longer. The products of decomposition of the organic matter are, according to Mr. Spencer, nitrites, or nitrates and carbonic acid.

It is claimed as *one* of the greatest merits of this material that its purifying properties are inexhaustible. This is substantiated, after a twelve years trial, by the evidence of witnesses, such as the secretary of the Southport Water-Works Company and the manager of the Wakefield Water-Works; but I looked in vain for analytical data in support of the evidence. At the former place, the water obtained from a well sunk in the red sandstone, near Southport, contained in solution, besides organic impurities, a considerable quantity of iron, which, it appears, is also completely removed by filtration through the magnetic oxide. At Wakefield the supply of water is taken from the river Calder, which, about the year 1860, became very impure, owing to contamination by the sewage of a population of about 70,000, and the refuse matter of several manufacturing establishments. This water, as stated by the manager of the water-works, has been rendered perfectly pure since the introduction of Mr. Spencer's plan, in 1864, and has ever since continued to be so. Here, again, I looked in vain for analytical data. I have myself made only a few experiments with magnetic carbide. I prepared it by heating hematite and charcoal in a large crucible until the first portions of the iron oxide were just beginning to be reduced to the metallic state. The purification of water by means of this product was not very marked; but some experiments with one of Mr. Spencer's filters, to which I shall refer hereafter, gave better results. This is probably owing to that gentleman's peculiar way of preparing his magnetic carbide.

Domestic filters for the purification of water by consumers should require very little attention—no frequent renewal of the filtering material, and the apparatus and the filtering material must be reasonably cheap. The number of domestic filters offered to the public is much larger than that of the plans for filtering water by water companies. Omitting all those filters which can merely effect a mechanical purification by means of sponges and the like, the filtering material in most domestic filters is animal charcoal. I have had such a filter in experimental operation for three months, filtering barely a gallon a day of a water, which was certainly purer than any one of the London waters. The result was that, whilst at first the purification was extremely satisfactory, it very soon fell off, and the water, after three months, was actually rendered a great deal more impure by passing through the filter.

The experience I had with moulded charcoal filters was even more unsatisfactory, their purification being almost only mechanical from the very beginning. From the well-known fact that the purifying action of animal charcoal, which is the only purifying ingredient in these filters, depends to a very great extent upon the structure of that substance, this result might have been anticipated, considering the treatment the animal charcoal has to go through in the preparation of these filters. Professor Clark's process, as originally described by him (in 1841), could not be applied to domestic filters, as it required burettes, test solutions, test papers, &c. An appliance, described in 1864 by Mr. Danchell, for rendering the admixture of a constant proportion of lime water to the water to be softened almost self-acting, might, in some simple manner, be adapted to domestic filters constructed on Dr. Clark's plan. It consists of an arrangement by which a certain proportion of the water supplied to the filter is made to pass through a compartment containing caustic lime in excess. The concentrated solution of caustic lime produced is reunited with the bulk of the water. The calcium carbonate in solution is thus precipitated and then retained by a mechanical filtering medium. The quantity of water which passes through the caustic lime compartment can be regulated.*

In 1867 most of the filters offered to the public for sale by the various proprietors were subjected by the *Lancet* to an analytical examination, with regard to the purification of water effected by them. These filters were—The syphon filter of the London Water Purifying Company (Danchell's plan), in which the filtering material is animal charcoal; the moulded carbon filter of Messrs. Atkins and Son, the silicated carbon filter by Dahlke, and the magnetic carbide filter by Spencer.

The examination was conducted in the following manner:—A certain quantity of water, supplied by one of the London water companies, was passed through each filter; a litre of the filtered water was then collected, and evaporated to dryness in a platinum dish. Towards the end of the operation some sodium carbonate was added, in order to decompose any magnesium chloride present; the dry residue was heated to 120° to 130° C., and weighed with the usual precautions. It was then incinerated, and again weighed with the usual precautions. Thus the following figures were arrived at:—

	Solid Residue dried at 120° to 130° in 100,000 parts.	Loss on Heating.
Unfiltered water	29·10	1·80
Danchell's cistern filtered water	14·90	·45
Moulded carbon filter	31·27	1·10
Silicated carbon filter	27·65	·90
Magnetic carbide filter	28·45	·05

The figures are stated to agree with the observations made during the evaporation as to the smell of the samples and their behaviour on heating, with the exception of that filtered through the silicated carbon filter.

The only other test applied is that of potassium permanganate. Omitting the figures given, the result arrived at was that Danchell's cistern filtered water required (when quite new) the least quantity of oxygen for the oxidation of organic matter. After being in use for some time the effects were less marked. Next came the magnetic carbide, and then the silicated carbon filter, which latter required twice as much oxygen as the former. The moulded carbon filter gave, in one instance, slightly better figures than the unfiltered water; in another, almost the same figures.

The select committee of the Metropolis Water (No. 2) Bill, 1871, resolved, "that the committee decline to enter into the comparative merits of different processes of purifying or filtering the water."

I am not aware of any other report of this kind. It is my intention to communicate presently some comparative results which I obtained in regard to the purification effected by a few filters; but, taking into consideration the large business done by the various filter companies, I beg to suggest that it would be extremely valuable if the merits of the filters offered to the public were thoroughly sifted by some impartial body, vested with sufficient authority; and, in my opinion, this society would confer a great boon on the general public, by entrusting a committee with the task of examining the purifying action of such filters, and publishing their report.

I might continue these observations on filtering apparatus and media in general. But I wish to communicate to you to-night some experiments which I recently made on the action of metallic iron on impure water, and I am afraid I shall exhaust your patience unless I proceed to this matter at once.

The property of metallic iron of purifying impure water has been known for a long time. It was found that, if ships had to take in foul water, its quality was being materially improved by being kept in iron tanks for a sufficient length of time. Here the rolling of the ship, constantly renewing the contact between the iron and water, accelerates the purifying action, which on land, in a state of rest, is extremely slow. Dr. Medlock first proposed, in 1857, to employ iron as a purifying medium, by suspending, in a tank or reservoir containing the water to be purified, by means of iron rods passing across it, iron wire of about $\frac{1}{16}$ of an inch in diameter, loosely packed in bundles or coils, in the proportion of about 1 lb. by weight of wire to every 100 gallons of water. The water was to be left in contact with the iron wire for 24 to 48 hours. Accepting the latter figure, a simple calculation tells us that for the London supply alone about 1000 tons of such wire would be required. This enormous quantity would obviously have to be made for the purpose, and would require not unfrequent renewal, consequent to the corrosion of such fine wire. Moreover, the contact offered even by such a quantity appears insufficient, for, after doubling the proportion of iron wire proposed by Medlock, and leaving it in contact with the water to be purified for 48 hours, I found the purifying action very trifling. If applied to filtration by water companies, the storing of the water supply for 48 hours would here again be another insuperable difficulty.

Dr. Medlock explains the action of iron by its converting the nitrogenous matter and ammonia present in water into nitrous and nitric acid.

I have once before, in the chemical section of this society, alluded to the form of iron which I have proposed for the purpose of chemically purifying impure water. This is the so-called spongy iron, or metallic iron, which has been reduced from an oxide without fusion, and which is hence in a loose spongy state. Spongy iron, of which I here exhibit a sample, is made at present from burnt ores which are the residues of Spanish or other pyrites, after extracting their sulphur in the manufacture of soda, and their copper by the wet chlorization process. This, as you are aware, is the extraction employed by the Tharsis Copper Company and many other works in the kingdom. At present, owing to the abnormal prices of coal and iron, the price of spongy iron is rather high, but under normal conditions it can be made at from £2 5s. to £2 10s. per ton. There are also other materials from which I am confident spongy iron could be made more cheaply, and which in all probability would be even better suited for purifying water than the spongy iron made from burnt ores.

One cubic foot of spongy iron, in the loose state in which it is best suited for purifying water, weighs only 70 to 80 lbs. It is thus evident that, weight for weight, it must offer an incomparably greater surface to the water than iron in any other form. Besides, if we bear in mind certain properties of a spongy platinum—its oxidation and conversion into acetic acid of alcohol—the supposition is not far fetched that spongy iron may also possess properties differing from those of iron which has been fused.

I have experimentally investigated the following properties of spongy iron:—

1. It decomposes water—even distilled water—which has been previously boiled. The decomposition of water is more energetic at the boiling point.

2. It reduces nitric acid to ammonia. This was proved in the following manner:—One of Fresenius's tubulated cylinders for washing gases was filled with spongy iron, and the latter washed with pure distilled water free from ammonia. No ammonia could be detected in the wash-water by the Nessler reagent. Then a solution of saltpetre, containing 5 m. gr. of nitrogen per litre, and free from ammonia, was slowly filtered through the spongy iron at the rate of 1 volume of the fluid, equal to the volume of spongy iron in the filters, in 3 hours. The filtrate contained 1·4 m. gr. of nitrogen per litre in the state of ammonia, or 28 per cent. of the equivalent quantity of nitric acid contained in the liquid.

3. From the fact that organic nitrogen and albuminoid ammonia are always much reduced after filtration through spongy iron, the conclusion must be drawn that spongy iron is capable of decomposing nitrogenous organic matter. Also the organic carbon, as will be shown presently, is very considerably reduced by filtration through spongy iron.

4. A minute, almost constant quantity of iron, about 10 m. gr. per litre, is dissolved by means of the carbonic acid contained in water, when filtering it through spongy iron, forming ferrous carbonate. The latter is very soon oxidized and precipitated, and it may then be so completely separated from water by mechanical filtration through paper or sand, or by allowing it to subside, that potassium ferricyanide no longer indicates a trace of it.

If the water containing iron in solution be made to pass through a layer of finely divided marble, or ordinary limestone, the iron is retained at once as ferric-hydrate.

The Loch Katrine water exhibits a peculiar and quite exceptional behaviour when filtered through spongy iron. If it be filtered very slowly, it comes out quite clear; but if filtered at the ordinary rate of other water, it turns yellowish, without depositing a precipitate of iron even after months. On adding nitric acid, the water, of which I here exhibit a sample, becomes colourless; ammonia reproduces the yellowish colour, and deposits, after some time, a small quantity of ferric-hydrate. Sodium carbonate renders the liquid opalescent, but produces no precipitate, even after several days standing, whilst the liquid becomes colourless by filtration through finely pulverized marble. One drop of a very weak solution of potassium permanganate produces a red colouration permanent for at least half an hour. Some carbonic acid, passed into the yellow liquid, produces, in the course of a few hours, a precipitate of ferric-hydrate, and it becomes perfectly colourless. The same effect is produced by passing a moderate quantity of carbonic acid into the Loch Katrine water before filtering it through spongy iron. Potassium sulphocyanide, as might be expected, does not produce a red colouration, and ammonium sulphide does not indicate the presence of iron, unless the solution be boiled with a few drops of nitric acid previous to the addition of ammonium sulphide. Pure distilled water, on being filtered through spongy iron, neither dissolves iron nor turns yellowish.

It is clear that this yellow colouration is due to some ferrous compound formed if the quantity of carbonic acid in water be insufficient; but I am at a loss to name any known compound which would exhibit the above behaviour, especially one from which the iron would be precipitated by carbonic acid, which is, as a rule, a solvent of iron. Under ordinary conditions the water passes through the filter perfectly colourless, and only becomes opalescent when the iron begins to be precipitated; the precipitation of iron is retarded by passing an excess of carbonic acid into the water before filtration. The quantity of iron dissolved is of practical interest as regards the purification, inasmuch as the purification is more energetic, if by passing carbonic acid into a water the quantity of iron dissolved be increased. I have proved this by direct experiments.

5. The purification of water increases slightly for some five or six hours after he filtration through spongy iron has been completed.

* For the reasons explained above, I have recommended limestone in preference to animal charcoal for removing the dissolved iron. However, some conversation I had with Dr. Frankland induced me to reconsider this point. The obvious advantage of limestone consists in the exclusion of all organic matter from the filtering material, but if users will change the animal charcoal every three months, it has several advantages over limestone. Animal charcoal appears to be able to decompose certain organic bodies, upon which spongy iron has little or no action and *vice versâ*. It also retains free ammonia to a greater extent than spongy iron. Moreover I found, experimentally, that animal charcoal, when employed in the spongy iron filter, still added to the purification effected by the spongy iron after three months use. The only suggestion I can offer in explanation of the apparent different behaviour of animal charcoal when used alone and when in combination with spongy iron, is, that we can well suppose, that animal charcoal remains longer active and is less liable to undergo decomposition, if the water passing through it be first purified by spongy iron. I have therefore decided to recommend animal charcoal as a substitute of limestone in the spongy iron filter, especially during epidemics.

6. If the iron be prevented from dissolving by adding to the water before filtration a minute quantity of sodium carbonate, the purifying power of spongy iron is considerably diminished.

7. The purifying action of spongy iron on organic matter is more energetic in hot weather than in winter, when the temperature of the water is frequently below the point (5° or 8°) at which fermentation ceases almost completely. These points appear to confirm my opinion, expressed on former occasions, that the action of spongy iron on impure water is twofold—namely, chemical and mechanical. The chemical action must be found in its decomposition of water, to which is probably owing, in part at least, the decomposition of nitrates and nitrites, and the direct combination of nascent hydrogen with the nitrogen, to form ammonia. The readiest explanation for the decomposition of water is the intimate contact between electro-positive and electro-negative bodies, such as metallic iron and carbon, or even metallic iron and any ferric-oxide which has escaped reduction; and it may be well supposed that, consequent to the galvanic current thus produced, the atmospheric oxygen dissolved in water is ozonized, and caused to act as a powerful oxidizing agent. I am driven to this conclusion from the results of a large number of analyses made before and after filtration through spongy iron, which, notwithstanding the fact of the reduction of nitrates and nitrites, also clearly indicates an oxidizing action shown by the increase of nitrates after filtration. This increase is mostly considerable—up to twice the original quantity—whilst sometimes there is also a decrease. The quantity of albuminoid ammonia is, as already explained, considerably reduced through the filtration. There is no fixed rule for the increase or decrease of free ammonia before and after filtration, which appears to depend upon the predominance of certain agencies.

I have already alluded to the action of the iron, which is dissolved, in the purification of water. This action may either consist chemically in the iron being reduced by agency of organic impurities, whilst in some low state of oxidation, to a still lower state—the organic impurities thus becoming oxidized. The iron thus reduced may again be oxidized either by means of the oxygen dissolved in water, or the oxygen resulting from the decomposition of water; or the action of the dissolved iron may be wholly or partly mechanical, consisting in a surface attraction of dissolved organic matter by the flocculent precipitate of ferric-hydrate, similar to the action of the precipitated calcium in Clark's softening process, of alumina and other bodies. That the ferric-hydrate has partly, at least, such a mechanical action, becomes probable from the fact that if its precipitation be hurried by boiling, the purifying action is lessened.

I regret that I have to offer several hypothetical explanations regarding the theory of the action, but, although further researches may throw more light upon the question, it is well intelligible that the action of such complicated bodies upon each other, some of which are present only in extremely minute quantities, should be enveloped in some mystery.

There is, besides organic matter, another dangerous substance not unfrequently met with in water—namely, lead. You will recollect that this question has at various times been the subject of inquiry to a number of scientific and practical gentlemen, and as you will presently see that it is for us locally of interest, I hope you will allow me a few remarks upon it.

In 1851, Graham, Miller, and Hofmann, stated in their report on the chemical quality of the supply of water to the metropolis, that they had arrived at the conclusion that softness of water alone is not itself to any great extent the cause of lead being dissolved from lead pipes. According to these gentlemen, supported also by researches made by Dr. Medlock at a later date, this is caused chiefly, if not wholly, by nitrates contained in water, which may either be lixiviated from rocks or be the product of decomposition of organic matter. The absence of calcium carbonate dissolved in free carbonic acid in water deprives the latter, in their opinion, of one of the readiest preventives of the solution of lead.

J. Smith found, in 1857, that as soon as the lead has begun to be corroded, or if it be exposed alternately to water and air, the corroding action of water is increased.

Pettenkofer experimented in 1864 on this question, and arrived at the conclusion that lead is oxidized exclusively by the action of atmospheric oxygen dissolved in water. Hence he shares Smith's views, that an alternate or simultaneous exposure to water and air is the most favourable condition for the corrosion of lead pipes. He is further of opinion, that the frequently observed action of soft water on lead pipes is due to the absorption of oxygen by rain water. To the same cause may be due the action of soft river water, whilst hard water, which, when taking up mineral matter, loses more or less of its oxygen through the oxidation of organic and other matter, has a less corroding action.

Dr. Cr. Calvert communicated to the meeting of the British Association, in 1861, the result of some 300 samples of Manchester water which he tested during a period of more than twelve months. His conclusions are that the corroding action on lead pipes is strongest during the first four days, and that it then gradually decreases, unless the water be allowed to stand in pipes, or unless lead pipes be for a time in disuse and then again employed. He found that soft water, which is almost free from organic matter, may also under certain circumstances corrode lead pipes to a great extent.

It is well known that in 1862 H. Schwartz proposed to put a stop to the corrosion of lead pipes, by converting their interior superficially into lead sulphide, by means of a hot concentrated solution of sodium sulphide. He stated that not the least trace of lead is dissolved from pipes thus prepared, even when distilled water is allowed to stand in them for four weeks. I am not aware of any practical experiments with Schwartz's plan, and it would at any rate be a great difficulty to remedy the corrosion, as the lead pipes already laid would have to be removed, which appears hardly practicable.

I would not have entered into these details had I not convinced myself, by an experiment, that our Loch Katrine water may also, under favourable circumstances, dissolve considerable quantities of lead. I allowed two gallons of Loch Katrine water to be in contact for 48 hours in a large evaporating basin with two pieces of old lead tubing. The contact under these conditions was certainly not nearly as large as it is in lead pipes of even large diameter, but I found that very nearly 2¼ milligrammes of lead per litre, or 0·175 grains per gallon were dissolved. The lead could easily be estimated without concentration, by adding to the water, after filtration through paper, a drop or two of hydrochloric acid and then some sulphuretted hydrogen water, as proposed by Persoz. It was then compared with a standard solution containing a known quantity of lead.

I filtered the water which contained the lead in solution through one of the spongy iron filters. In the filtered water no trace of a colouring could be detected as above, and even after concentration to $\frac{1}{30}$ of its volume, the presence of lead could not be detected. This result was to be expected from the well-known fact that lead salts are precipitated by metallic iron, and that spongy iron is a much more energetic precipitant than iron in other forms. This property, too, is an important and welcome addition to the employment of spongy iron for purifying water.

Allow me, in concluding, a few words about the practical application of spongy iron to the purification of water.

One of the most important questions in regard to any filtering material is—How long will it remain active, and when does it require to be renewed? In answering this question, I prefer to omit laboratory experiments, but I may mention that in London, at the water-works of the Southwark and Vauxhall Company, an experimental spongy iron filter has been at work since the end of October last, which has an area of 50 square feet, and a thickness of spongy iron of 1 foot. The water is calculated to pass through this filter at the rate of 300 cubic feet an hour, but I understand the supply is somewhat deficient, owing to the size of the supply-pipe. The last sample of filtered and unfiltered water was sent to me when the meter indicated 100,000 cubic feet of water, or 2000 times the volume of spongy iron in the filter, I then found the purification, notwithstanding the unfavourable action of the cold weather, equal to that obtained when first starting the filter.

Of course these 2000 volumes give nothing like a practical result if the spongy iron is to be used by water companies; but, for the reasons before explained, I would prefer to see it used in small domestic filters, and in this case, if such a filter were to contain one gallon by volume of spongy iron (or 10 to 12 lbs. by weight), a yield of 2000 gallons of purified water with an undiminished action of the spongy iron would more approach a practical result. Supposing 10 gallons of water a day for cooking and drinking, such a domestic filter would, as far as the action of the spongy iron is concerned, purify as energetically after 200 days as on the first day; so that, doing away with all hypothesis, it would certainly not require a renewal under less than six months of constant use, and at a cost of hardly one shilling. Of course, in such domestic filters, the filtration can be made much slower in order to effect a more complete purification than would be practicable for water companies. I should think that one gallon in half an hour, or even in an hour, is a sufficient speed for domestic filters.

I have been ably assisted by Messrs. Murray and Co., of the Caledonian Pottery, Rutherglen, in the construction of such domestic filters according to my design.

The spongy iron through which the water to be filtered or purified first passes, is contained in a stoneware vessel with a slightly curved bottom. On the top of this bottom there is a perforated bottom on which the spongy iron rests. An opening in the curved bottom is connected with an earthenware pipe which passes up the outer side of the vessel to slightly above the level of the spongy iron. Here the pipe communicates with another pipe, which passes from the top of the outside of the spongy iron vessel down to the centre of its closed bottom. The latter pipe is open at the top and bottom, for if it were closed at the top it would act as a syphon and draw off the water from the spongy iron, which should as far as possible always remain covered with water. An alternate exposure to air and water causes the spongy iron to be oxidized, when it loses more or less its purifying power. A screw tap at the lower end of the latter pipe serves to regulate the flow of the water through the spongy iron.

The spongy iron vessel is placed into the casing of an ordinary stoneware filter with perforated bottom, beneath which there is a reservoir for the filtered water. On the top of the perforated bottom is placed a layer, some four inches thick, of finely divided marble or limestone, on to which the water, which contains the iron in solution, flows from the screw tap. By the action of the limestone the water is readily freed from iron, and collects in the reservoir ready for use.

The whole filter is covered with a lid as usual.

The layer of spongy iron is about 8 inches thick, and I prefer having 6 inches of a rather coarse and 2 inches of a finer spongy iron on the top, in order that the latter may also act as a mechanical strainer retaining suspended impurities. If the water contains much suspended matter, the finer spongy iron may from time to time be renewed.

The following analytical results were obtained in my laboratory when filtering water, slightly contaminated with sewage, through Spencer's magnetic carbide filter, Dahlke's silicated carbon filter, and the spongy iron filter. All these filters were well washed with the filtered water before collecting the sample; the latter was analyzed immediately, as it was found that the water filtered through the spongy iron filter improves on standing. The latter filter yielded 1 gallon in 45 minutes, the other filters, being of smaller size, 1 gallon in 90 minutes, as far as this was practicable, owing to their liability to become choked.

Description of Water.	Free Ammonia.		Albuminoid Ammonia.		Organic Carbon.		Organic Nitrogen.		Total comb. Nitrogen.	
	Found.*	†	Found.*	†	Found.*	†	Found.*	†	Found.*	†
Unfiltered water . . .	0·0694	100	0·0225	100	0·2499	100	0·0843	100	0·1414	100
Same filtered through Spence's filter. . .	0·0602	87	0·0108	48	0·1045	42	0·0431	51	0·0927	65
Same filtered through Dahlke's filter . . .	0·0389	56	0.0102	45	0·0558	22	0·0764	90	0·1084	76
Same filtered through spongy iron filter . .	0·0522	75	0·0056	25	0·0216	10	0·0216	26	0·0646	46

* In 100·000 parts of water.

† This column shows the per centage still contained in the filtered water, the unfiltered water = 100.

I have here a microscopic preparation of the unfiltered water, and of the same water after filtering through spongy iron. The samples were obtained by evaporation at a low temperature—a method explained by me at the meeting of the British Association at Edinburgh. The preparations speak for themselves, showing an unmistakeable purification even to the uninitiated eye. I classify the sample filtered through spongy iron from my microscopic examination as a water of a very fair quality.*

I expect there are some medical gentlemen here present, and I wish just to say a few words about another application of spongy iron. The apparatus here before you consists of a spongy iron filter through which water, highly charged with carbonic acid, passes from the seltzogene. During a visit to some of the German iron and steel waters, the idea suggested itself to me, that the carbonated iron water thus produced, instead of the natural water, might be employed, in some cases with advantage, and that the iron in this form may be preferable even to the ordinary preparations generally used.† Some medical gentlemen, to whom I mentioned my idea, told me that artificial ferrous carbonate had never been used internally before, but that they thought the matter well worth trying. I omit the observations which I have made myself in reference to the effect of my preparation, and beg leave to conclude with a report kindly sent to me by Dr. Thomas, of the Royal Infirmary, to whom I gave such an apparatus about the beginning of December.

Dr. Thomas writes:

"Your carbonated iron water has been used in five cases, the quantity allowed being a tumbler full three times a day. Some of the cases were phthisical patients with a considerable degree of stomach derangement, indicated by nausea and occasional vomiting. They were also very anæmic. I desired the patients at the time they commenced the treatment to watch the effect closely, and at the present date they all state, without the slightest hint from me that now the stomach gives them no trouble, that they have a great relish for food, and feel stronger. The colour has also improved, but this may be owing to the better diet.

"The fourth case I tried it in was one of chronic vomiting, and it entirely failed to mitigate the symptoms in the least. The fifth case was one of pure anæmic in a hysterical girl. It was the only treatment adopted except a little potassium bromide, and she gathered flesh, and acquired a better complexion, and this more especially after the potassium bromide was stopped owing to its bringing out a rash. I fancied also that it modified the diarrhœa in one of the cases very considerably. No other drugs were used in the cases during the trial. But the trial has been far too limited to afford any definite grounds for drawing inferences

* The latter sample exhibited only well-defined crystals of calcium carbonate, whilst the unfiltered water exhibited no such crystals, but those organisms which always accompany fermentation.

† A similar suggestion was made several years a by Von Hauer.

as to the effects, and it would require much more extended observations before any definite conclusion could be legitimately laid down. Still the results, as far as they went, seemed very favourable."

Thus far Dr. Thomas. The apparatus is inexpensive, and any one can put it together, excluding the seltzogene, for a couple of shillings. It is thus easily accessible even to poor people.

GASLIGHT ASSOCIATION OF THE UNITED STATES.

President's Address.

The Second Semi-Annual Meeting of the above Association was held in Cleveland, on Wednesday, May 13—Mr. W. H. Price, President of the Cleveland Gaslight Company, presiding.

The President, in opening the proceedings, delivered the following address:—"Gentlemen,—This association has grown out of a necessity which has been felt, and which arose mainly from the fact that there is a very great dearth of educated gas engineers and gas managers in this country. We have no schools, no associations, no arrangements made by which that body of men who are called upon to build and to manage gas-works can be educated. Nearly all of us, I presume, have come into this specialty in a certain sense accidentally. I presume we have present with us some who have been educated to the profession; but I speak in general terms. It has been long felt to be a necessity that we should associate together, for the purpose of combining what knowledge and what experience we have acquired in perfecting ourselves in the art and science of making and distributing illuminating gas. This association is entirely and strictly for mutual improvement, and has no other purpose. As the cities and towns of this country have grown and developed, gas companies have been organized, and now no town having a sufficient size or sufficient population can afford to do without gas-works. Nearly every little town in the Northern, and many of the Southern, States is supplied with gas companies and gas-works. This interest has become large, and it seems necessary that it should be developed in the best possible manner; and this can only be done by meeting occasionally and comparing our views, our theories, and experiences. We are all confronted at every step by difficulties. The gas manager lives too much isolated. Nearly all of his time he is confined to his works. He travels too little, learns little of the experiences of others, and hence he is very apt to run in the rut in which he started. Perhaps the party who first built the works gave it a certain cast, a certain direction, and year after year it runs in that same rut, without making any expansion.

Now, this society has been organized to get ourselves out of all ruts; to learn what are the best methods of construction, and the best methods of applying labour and manipulating material, so as to give our towns and cities the best quality of gas at the lowest price.

We are constantly assailed by those who wish to sell us patents to revolutionize the whole system of gas-making. While on the one hand we should not shut our eyes to all proper improvements, yet on the other hand we should be careful not to take in at once everything that is claimed to be an improvement. We have associated together for the purpose of carefully discussing and investigating the claims of these different improvements. Many of them are old, and have been two or three times exploded, but are occasionally revamped and brought forward.

When this association was organized it was on a broad basis. It was to consider all claims of materials to be used, and the best methods of using them. I hope we have come together in a liberal spirit, and with a determination to sit here long enough to listen to the articles that have been prepared, and to engage in the discussions which shall grow out of them, and to gather up as much as we can of experience and knowledge, to be used in the interest of our companies at home.

CONTAMINATION OF A WELL BY THE WASTE FROM A GAS-WORK.

By F. Fischer.

In stating the results of a water analysis, it is preferable, for the sake of comparison, to put down the metals and the acid radicals separately—*e.g.*, K, Ca, Mg, &c., CO_3, SO_4, NO_3, Cl.

A good potable water should in general satisfy the following conditions:—

1. It should be clear, and without taste and smell.
2. The temperature should vary at different periods of the year only within narrow limits (6° to 12° C).
3. It should contain very little organic matter and no organisms, such as bacteria, no eggs of entozoa, &c.
4. It ought to be free from ammonia and nitrous acid, and contain no large quantity of sulphates, nitrates, and chlorides.
5. It should not be too hard, and should not contain much magnesia salts.

Degree of hardness 16·8 (German scale).

The following is the result of the analysis of a well examined by the author:—

	Equiv.		Mgrs.		Should be at most.
Organic matter	26·24	..	(= 4198·4) per litre	..	0·25 equiv.
Chlorine (Cl)	12·40	..	(= 440·2) „	..	1 „
Sulphuric acid (SO_3)	24·79	..	(= 991·6) „	..	2 „
Nitric acid (N_2O_5)	0·04	..	(= 2·3) „	..	0·5 „
Nitrous acid	0	..			0 „
Ammonia (NH_3)	4·80	..	(= 81·6) „	..	0 „
Calcium (CaO)	32·36	..	(= 906·1) „	..	4 „
Magnesium (MgO)	6·81	..	(= 136·2) „	..	2 „
Total hardness	109·7°				
Variable hardness	14·8°				

No bacteria, &c.

Large quantities of sulphocyanates were present (400 mgrms. of potassium sulphocyanate in a litre).

The contamination was traced to a gas-work 300 mètres distant.—*Journal Chemical Society.*

IRON AND COAL TRADES OF SHEFFIELD, SOUTH YORKSHIRE, AND NORTH DERBYSHIRE.

(from our own correspondent.)

Trade continues duller than it has been for a period of several years prior to the present time. In no single branch of industry is there anything like briskness, albeit some of the minor trades are doing a moderately good business.

Pig iron remains stiff in price, and the supply is so limited that, were the inquiry to improve in any appreciable degree, quotations must needs advance very considerably. Current quotations for Cleveland pig are about as under:—No. 1 foundry, 90s.; No. 2 foundry, 82s. 6d.; No. 3 foundry, 80s.; No. 4 foundry, 75s.; No. 4 forge (grey), 67s. 6d.; No. 5 forge (mottled), 65s.; No. 6 forge (white), 60s.; refined metal, 87s. 6d.; kentledge, 50s.; and cinder pig, 80s., all for net cash, f.o.b. in the Tees. "Ayresome," and other superior Yorkshire pig, is held at figures which are for the present wholly nominal. The Derbyshire furnaces and foundries are still fairly busy, Staveley, in particular, being fully employed on pipe-castings and general foundry work.

The colliers wages question threatens to result in a lock-out on a very extensive scale. On Monday the South Yorkshire and North Derbyshire colliery proprietors met at Barnsley, under the chairmanship of Mr. Stewart, and decided to give the men 14 days notice to leave their work unless they agreed to accept the reduction of 12½ per cent. in wages. These notices were served on Thursday last, and will expire on July 8. If the men, in any case, or the whole, decline to continue work at this drop they must leave, and the pits will be set down. In a few cases, however, the men and masters have sensibly arrived at a compromise which disposes of the difficulty.

The Clay Cross Coal and Iron Company have just sunk a shaft, 14 feet in diameter, to the steam coal at Merton. This is the only one of the company's seven pits which will work the steam coal. A powerful plant has already been put down.

There is, locally, a slightly better inquiry for steam coal, partly for shipment and partly for London. An increased tonnage is being sent to Hull, but the trade, as a whole, is capable of much improvement. Prices of both house and steam coal are nominally unaltered. Coke is to be had in almost any quantity at 25s. to 27s. 6d. per ton.

The annual meeting of the Dronfield Gas Company was held on Thursday, under the chairmanship of Mr. H. Sway, when a dividend of 4½ per cent. was declared.

At Heanor some difficulty is being experienced in giving an adequate supply of water to the higher parts of the town. Stop-cocks have been put in at several points to "back up" the water, but the desired result is stated to be still a matter of the future.

The Rotherham Town Council has had a discussion on the water supply question. Mr. Kelsey found the total quantity supplied on a given day was about 24½ gallons per head, or, for 28 days average, 15 gallons per head, so that it appeared strange that they only had the water on six hours per day. It appeared to him that there was a great quantity running to waste. The subject dropped without any resolution being come to.

Mr. Walter Ashton, the new general manager of the Sheffield Water-Works Company, has commenced his duties.

The question of improved water supply is being discussed at Swinton.

THE NORTHERN COAL TRADE.

(from our own correspondent.)

There is a prospect that the strike in the Cleveland iron district may be settled this week, but it is difficult to say positively. The Thornley colliers have returned to their work, and have submitted to the terms of the masters that they shall not limit the production of the mines, when they work, to 10 days a fortnight. The continuation of the Cleveland strike is putting a stop to most business in the South Durham district. Manufacturing and coking collieries are limiting their production. The price of coke and manufacturing coals is lower. The gas coal trade in the Durham district is likewise adversely influenced by the state of the iron trade. The quotations on 'Change at Newcastle are—best gas coals, 13s., less 2½ per cent.; seconds, 10s. 6d. per ton, with a similar discount. Manufacturing coals, for mixing, are 25s. to 28s.; and small, 16s. per chaldron, less 2½ per cent. This is generally a busy season in the steam coal trade. It may be fairly stated that it is firmer, with shipping terms longer. Quotations are—best steam, 18s.; seconds, 16s. per ton., with the usual discount.

In the shipping trade 6s. per ton has been paid to small ships to load coals for London, and pretty good rates are upheld for coasters to load for the ports of the British Channel in the gas and household trades, but there is still plenty of steam tonnage open to engagements for ports that take that class of vessel, and at moderate rates.

A little better intelligence from New York has caused some classes of chemicals to be a trifle firmer, but the chemical trade of the north is in a poor condition, and very few concerns are making profits. The general trade of the Newcastle district was a little firmer in tone last week. The export trade of the Tyne, however, continues to be much less than last year. All classes of goods show a falling off, especially to ports such as Hamburg, Dunkirk, and Rotterdam. The best business is done to Antwerp. Timber is likely to be somewhat cheaper than it has been, and cement and such like articles are being more pressed upon the market.

Death of Mr. Frederic Albert Winsor.—We regret to announce the death, on the 7th inst., of Frederic Albert Winsor, Esq., of the Inner Temple, barrister-at-law, aged 78. He was the son of Mr. F. A. Winsor, the originator of public gas lighting, and occupied the position of a director of the Chartered Gas Company from 1850 to 1872.

Discovery of Coal at Birmingham.—The engineer and secretary of the Sandwell Park Mining Company has issued a circular to the shareholders, in which he says: "I have the pleasure to inform you that at seven o'clock last night (Friday, June 5) the sinking of the shaft through the thick coal was completed, and the total thickness from top to bottom found to be 6 yards 2 feet 6 inches. The top coal is 14 feet 9 inches thick, of excellent quality, and the bottom coal 5 feet 3 inches, not quite so good a quality, having the hard stone parting, 6 inches thick, lying between. The dip is about due east, at the rate of about 5 inches in a yard. The sinking is still proceeding, in order to prove the existence of the heathen coal and gubbin ironstone, which ought to lie about three or four yards below the thick coal, after which a shareholders meeting will be called."

Perth Gas Commission.—At the annual general meeting of the members of this commission, held on the 8th inst.—Bailie M'Kenzie presiding—the estimates for the current year were discussed. The revenue was estimated at £13,834 6s. 8d.; and the coal and other accounts were estimated at £12,843 8s. 4d.; £500 was required to be set apart towards the payment of borrowed money; £300 was proposed to be set aside for the "Contingency and depreciation of works fund;" and £190 18s. 4d. was proposed to be applied towards the reduction of preliminary and parliamentary expenses, making the estimated expenditure equal to the estimated income. A motion was made and carried to the effect that £50, instead of £300, shall be set aside for the "Contingency and depreciation of works fund," and that £250 be carried forward to next year's account. A motion was also made, but was lost on division, that the Commission discontinue to give a discount of 10d. per 1000 feet to consumers of above 100,000 feet of gas. Further discussion was adjourned until the treasurer should prepare new estimates giving effect to the resolutions carried.

Appointment of Medical Officer of Health for the City of London.—At the Sewers Court, on Tuesday last, Dr. W. Sedgwick Saunders, a member of the Court of Common Council, was appointed to fill this important office. There were three candidates, the other two being Dr. Conway Evans and Dr. C. Meymott Tidy. The solicitor to the commissioners gave it as his opinion that Dr. Saunders, being a member of the Court of Common Council, was disqualified for the office, under the 42nd section of the Sewers Act, which is in these words:—"Provided also, and be it enacted, that no person, being a commissioner or a member of the Court of Alderman, or of the Common Council of the City, shall be directly or indirectly interested or concerned in any contract which shall be made or entered into, by or on behalf of the commissioners, for the execution of any works by this Act directed, or authorized to be done or executed, or for furnishing materials or labour, or for any other matter or thing whatsoever, upon pain that every such contract shall be null and void; and that the," &c. In his judgment, the engagement of a man to perform the duties of this office was a contract, and that the election of Dr. Saunders would be null and void. Mr. H. L. Taylor moved to defer the election until the opinion of the Attorney-General could be obtained on the point, but the motion was negatived by a small majority, and the election was proceeded with. After the appointment of Dr. Saunders as medical officer, the election of a food analyst was proceeded with. There were four candidates—viz., Mr. C. Heisch, Mr. C. Peisse, Dr. Tidy, and Dr. Saunders. The last-named gentleman carried this appointment also. The salary for the combined offices is £600 a year.

Register of New Patents.

APPLICATIONS FOR LETTERS PATENT.

1952.—Tandy, G. G., Penge, and Dryden, J. A., Stewart's Lane, Surrey, "Improvements in lamps." June 4, 1874.

1957.—Hazlehurst, G. S., Runcorn, "Improvements in apparatus for pumping liquids." June 5, 1874.

1958.—Stacey, J. T., and Lack, A., Newbury, "Improvements in the construction and arrangement of apparatus for carburizing atmospheric air to be employed for illuminating and other purposes." June 5, 1874.

1959.—Hughan, W. H., Southport, "Improvements in the treatment of sewage and like matters to utilize them as manure, and in the production of an artificial fuel to be employed in the said treatment, and for other purposes." June 5, 1874.

1973.—Matthews, H., Bristol, "Improvements in apparatus for preventing the return or back flow of gas, water, and other fluids in sewers, drains, and other similar situations." June 6, 1874.

1978.—West, J., Maidstone, "Improvements in apparatus used in the manufacture of gas." June 8, 1874.

1983.—Dann, J. T., Brixton, Surrey, "Improvements in the construction of apparatus for lighting, extinguishing, and regulating gas-flames." A communication. June 8, 1874.

1992.—Walker, W. T., Highgate, Middlesex, "Improvements in the method of working gas-purifiers." June 8, 1874.

2009.—Casthelaz, J., Crumpsall Vale, near Manchester, "Improvements in the preparation of products of aniline and matters from which aniline is or may be derived." June 10, 1874.

2017.—Heale, H. W., Southwark, Surrey, and Gowan, E. D., Holloway, Middlesex, "Certain improvements in the manufacture and construction of taps or valves." June 10, 1874.

2026.—Harrington, J., Ryde, Isle of Wight, "Improvements in gaseliers." June 10, 1874.

2034.—Cliff, W. D., Wortley, near Leeds, "Improvements in machinery for making clay retorts and other similar heavy articles made from clay." June 11, 1874.

GRANTS OF PROVISIONAL PROTECTION.

1851.—Clark, A. M., Chancery Lane, London, "Improvements in apparatus for carburetting air and regulating the supply to the burners." A communication. May 27, 1874.

1868.—Oram, W., Salford, Lancs, "Improvements applicable to machinery for pumping or forcing water, air, or other fluids under pressure." May 28, 1874.

1896.—Kirkman, J., Chorley, Lancs, "Improvements in packing for the stuffing-boxes of steam-engines and pumps, and for other joints requiring to be made steam, air, or water tight." May 30, 1874.

1916.—Johnson, J. H., Lincoln's Inn Fields, London, "Improvements in apparatus for filtering or separating liquids from solid matters contained therein." A communication. June 2, 1874.

1929.—Schanzer, L. I. L., Odessa, Russia, "A new or improved instrument or apparatus for drilling and tapping or screwing mains under pressure, and attaching pipes, cocks, or connexions thereto." June 3, 1874.

NOTICES TO PROCEED.

327.—Budenberg, A., Manchester, "Improvements in injectors for raising and forcing fluids." A communication. Jan. 26, 1874.

342.—Lake, W. R., Southampton Buildings, London, "An improved apparatus for maintaining a constant level of water in wet gas-meters, and for separating from vapour liquid held in suspension in the same." A communication. Jan. 27, 1874.

347.—Tandy, G. G., Penge, and Dryden, J. A., Battersea, Surrey, "Improvements in lamps." Jan. 27, 1874.

348.—Whittingham, J., Great St. Helen's, London, "Improved apparatus for manufacturing gas for illumination." A communication. Jan. 27, 1874.

431.—Dennis, T. H. P., Chelmsford, "A new or improved water-waste preventer." Feb. 3, 1874.

506.—Atkins, F. H., Fleet Street, London, "Improvements in filters." Feb. 9, 1874.

531.—Johnston, W., Lima, Peru, "Improvements in machinery or apparatus for compressing air or gases." Feb. 11, 1874.

1072.—Jensen, P., Chancery Lane, London, "Improvements in modes of and means for producing and utilizing gas and heat, and apparatus therefor." A communication. March 27, 1874.

1382.—Johnston, W., Lima, Peru, "Improvements in machinery or apparatus for compressing air or gases, or for forcing water." April 17, 1874.

1360.—Johnson, R., Bradford, Yorks, "Improvements in machinery for exhausting and propelling air, gas, and other fluids and liquids." April 20, 1874.

1799.—Alexander, E. P., Southampton Buildings, London, "Improvements in liquid-meters." A communication. May 21, 1874.

PATENTS WHICH HAVE PASSED THE GREAT SEAL.

3980.—Tasker, W., Halifax, "Improved machinery for forming and welding and finishing couplings used for connecting gas and water pipes." A communication. Dec. 4, 1873.

4001.—Messenger, T. G., Loughborough, "Improvements in pipe-joints and in the couplings thereof." Dec. 5, 1873.

4017.—Mather, W., Manchester, "Improvements in apparatus used for the purpose of percolation or filtration of fluids or infusions, and the precipitation of bodies held in suspension in fluids." A communication. Dec. 6, 1873.

4038.—Cockey, H., and Cockey, F. C., Frome, Somerset, "Improvements in gas-stoves." Dec. 8, 1873.

4099.—Scott, H. Y. D., Ealing, Middlesex, "Improvements in the manufacture of cement." Dec. 12, 1873.

4130.—Phillips, J., Hammersmith, Middlesex, "Improvements in pipe-joints." Dec. 16, 1873.

4192.—Strode, W. W., Mackenzie, J., and Williams, E. P., Regent's Park, London, "Improvements in gas-stoves." A communication. Dec. 20, 1873.

4229.—Jacquet, F. A., Paris, "Improvements in portable gas cooking apparatus." Dec. 24, 1873.

4230.—Jacquet, F. A., Paris, "Improvements in gas heating apparatus." Dec. 24, 1873.

24.—Curtis, F., Boston, U.S.A., "Improvements in lamps." A communication. Jan. 2, 1874.

34.—Forbes, Rev. G. H., Broughton, Northampton, "Improvements in compounds designed for the manufacture of cements, plaster, or artificial stone, capable also of being used for artificial fuel." Jan. 2, 1874.

317.—Lucas, E. F. R., Coatham, Redcar, Yorks, "Improvements in the manufacture of anthracene." Jan. 24, 1874.

817.—Aronson, J. N., Portland Place, London, "Improvements in lamps." March 5, 1874.

1043.—Colebrook, C. T., Islington, Middlesex, "Improvements in pump-valves." March 25, 1874.

1065.—Peacock, J. C., Finsbury Park, Middlesex, "An improved form of stove and apparatus connected therewith for heating, lighting, ventilating, and cooking." March 27, 1874.

1286.—Lake, W. R., Southampton Buildings, London, "Improvements in double-acting lift and force pumps." A communication. April 14, 1874.

1336.—Thompson, N., Brooklyn, U.S.A., "Improvements in means for connecting together pipes or tubes, and for connecting cocks, tubes, or pipes to other articles." April 17, 1874.

PATENTS WHICH HAVE BECOME VOID

BY REASON OF THE NON-PAYMENT OF THE ADDITIONAL STAMP DUTY OF £50 BEFORE THE EXPIRATION OF THE THIRD YEAR.

1417.—Pollock, A. A., and Pollock, J. F. M., "Improvements in dry closets and commodes." May 26, 1871.

1453.—Sweeney, T., "An improved machine for measuring and registering a flowing liquid, termed a fluid-meter." May 31, 1871.

1485.—Whitaker, S., "Improvements in taps or cocks." June 5, 1871.

PATENTS WHICH HAVE BECOME VOID

BY REASON OF THE NON-PAYMENT OF THE ADDITIONAL STAMP DUTY OF £100 BEFORE THE EXPIRATION OF THE SEVENTH YEAR.

1297.—Holmes, J., "Improvements applicable to pumps for various purposes." May 3, 1867.

1561.—Frost, H., sen., and Frost, H., jun., "Improvements in apparatus for measuring fluids, which improvements are also applicable for pumping." May 27, 1867.

The General Acts relating to the Supply of Gas and Water.—Mr. Joseph Reeson, of the Horseferry Road Gas-Works, proposes to publish a reprint of these Acts in a convenient form for ready reference, with an index annexed thereto. Such a work, carefully prepared, will no doubt be found of great service by directors and officers of gas and water companies subject to the provisions of any of the Acts enumerated, and, as it is proposed to issue the volume at the moderate price of 5s., we expect that it will meet with a remunerative sale.

The GRAND MEDAL of MERIT at the VIENNA EXHIBITION has been AWARDED to

GWYNNE & BEALE'S PATENT IMPROVED GAS-EXHAUSTERS,

Fig. 224.

The BEST EXHAUSTERS IN THE WORLD.

Made under the personal superintendence of

Mr. BEALE,

The oldest Maker, Inventor and Patentee of GAS-EXHAUSTING MACHINERY.

(It is NOT CORRECT to state that Mr. BEALE has RETIRED.)

Prices and every information on application.

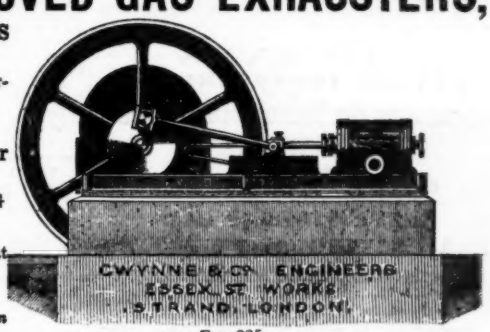

Fig. 225.

Fig. 224 represents one of those erected at the Imperial Gas-Works, Bromley, capable of passing 210,000 cubic feet of gas per hour. Several others of the same size are now on order for the same Company. These Patent Machines combine the highest quality of workmanship and materials, the largest bearings and wearing surfaces, with the **most perfect system of action yet discovered.** Fig. 225 represents one of a series of four at the Nottingham Gas-Works, each passing 92,500 cubic feet per hour. Gwynne and Co. *do not pretend to enter into a struggle with other makers in respect to cheapness. They have never sought to make price the chief consideration, but to produce Machinery of the very highest quality, and the most approved design and arrangement.* Their prices have been estimated with a due regard to the **excellence of the article produced,** and when this is taken into consideration, they have no fear for the result. The orders executed this season for Exhausters and alterations to their patented system amount to over 4,000,000 cubic feet of gas passed per hour, and to over 800 horse power for Engines to drive them. In every instance their work is giving the greatest satisfaction. Numerous testimonials and references can be given.

REGULATORS, BYE-PASSES, STOP-VALVES, GAS-VALVES, & MACHINERY FOR GAS MANUFACTURE, OF ALL SIZES,

CAN BE HAD ON APPLICATION TO

GWYNNE & CO., HYDRAULIC & GAS ENGINEERS, ESSEX STREET WORKS, STRAND, LONDON, W.C.

G. & Co. are now manufacturing for a London Gas Company three of their 210,000 cubic feet Patent Gas Exhausters, and many of all sizes.

WANTED quickly, to survey a Foreign Town, an experienced ENGINEER accustomed to the erection of Gas and Water Works.
Apply, with full particulars, prepaid, Box 14, Post-Office, BIRMINGHAM.

WANTED promptly, a thoroughly competent MANAGER for a small Gas-Work abroad.
Apply by letter, with full information and copies of testimonials, to WILLIAM BLEWS AND SONS, Gas Engineers, BIRMINGHAM.

WANTED, by an active and persevering young man, a situation as CLERK. Has had five years experience in a country Gas-Work. No objection to go abroad.
Apply to W. B., care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, by the Advertiser, a situation as WORKING FOREMAN, or to take the management of a small Gas-Work. Understands main and service laying, also meter taking and repairing and inside gas-fitting.
Address T. KENNARD, Gas-Works, LEATHERHEAD.

WANTED, a thoroughly practical and experienced person to SUPERINTEND the Erection of a small Gas-Work in a city ten days distance from England. Gasholder 55 ft. by 16 ft.
Apply by letter, with copies of testimonials and full particulars, to CONTRACTOR, 38, West Smithfield, LONDON, E.C.

WANTED, a second-hand cast-iron TANK and GASHOLDER, the latter to be in good condition, with columns, &c., complete. The diameter of tank to be from 30 to 35 ft., and 12 or 14 ft. deep.
Communications to be made to Mr. ALFRED PENNY, C.E., 20, Abingdon Street, WESTMINSTER.

WANTED immediately, a complete GAS PLANT to the end of delivery-pipe. The holder to be about 30 ft. in diameter, and all necessary pipes, purifiers, retorts, &c., to be in proportion for same.
Address G. F. C., 22, Warwick Street, NEW CROSS, S.E., and state lowest price for same.

WANTED, a situation as Working MANAGER of a small Gas-Work. Thoroughly understands the manufacture and distribution of gas, the setting of retorts, laying of mains and services, and gas-fitting. Has been 16 years in present situation. Can furnish satisfactory testimonials as to character and ability.
Address S. EDWARDS, Gas-Works, Presteign, RADNORSHIRE.

TAR DISTILLERY.

WANTED, a Gentleman able to take the SUPERINTENDENCE or MANAGEMENT of a Tar Distillery near London. He must be well acquainted with all the products of tar distilling.
Address T. B. X., care of Messrs. Deacon and Co., 154, Leadenhall Street, stating qualifications, particulars of previous engagements, and salary expected.

WANTED, by the Advertiser, aged 29, an engagement as ASSISTANT ENGINEER or Manager of a Gas-Work; 13 years experience in erecting and managing works, &c. Is a fair draughtsman. Has a knowledge of chemistry. Can analyze gas, &c., and use the photometer. Can furnish testimonials as to ability.
Address E. A., 18, Cawley Road, SOUTH HACKNEY, E.

WANTED, an engagement as Manager or MANAGER and SECRETARY of a medium sized Gas-Work. Thoroughly understands the manufacture and distribution of gas, having had many years experience, and can give most excellent testimonials as to character and ability.
Address MANAGER, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, by a Gentleman, aged 27, a situation as MANAGER, on the Continent or abroad. Advertiser has been four years in present situation, where the make is above 90,000,000 feet per annum. Understands the manufacture and distribution of gas in all its branches. Speaks French and Italian. Leaving present situation on account of salary being insufficient.
Address SCIENCE, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

VINCENT'S
PATENT IMPROVEMENTS
IN
Apparatus for Manufacturing Gas.
Particulars to be obtained by application to—
MR. LAYARD JONES,
ENGINEER,
25, OLD BROAD STREET, LONDON, E.C.

ADVANTAGES OF GAS
FOR COOKING AND HEATING,
BY
MAGNUS OHREN, A.I.C.E., F.C.S.

For Companies to issue to their gas consumers.
Specimen Copy by post 4d., direct from MAGNUS OHREN, Gas-Works Lower Sydenham, London, S.E.

ROBUS, SIMPSON, & ROBUS,
(Late of the Crystal Palace District Gas-Works, Sydenham, and the New City Gas-Works, Montreal, Canada,)
GENERAL CONTRACTORS & RETORT-SETTERS,
FITTERS & MAIN-LAYERS.
RETORTS SET ON THE LATEST IMPROVED PLAN.
Retort-Setters sent to all parts of Europe and America.
Address, J. and H. ROBUS,
BELL GREEN, CATFORD, KENT.

WANTED to purchase, 5000 to 10,000 tons of GAS COKE. Waggons can be sent to any station for any proportion of above.
Address G. J. EVERSON, Gas Coal and Coke Merchant, STOURBRIDGE.

THE Advertiser desires an engagement as Manager, Assistant Engineer, or Superintendent of a Gas-Work. Thoroughly understands the manufacture and distribution of gas, having had many years experience, and can give most satisfactory testimonials as to character and ability.
Address Y. Z., care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

THE Advertiser, son of a Gas Manager, 25 years of age, is open for an engagement, home or abroad, as MANAGER of a medium-sized, or ASSISTANT MANAGER of a large, Gas-Work. Has had 12 years experience in the gas business. Can forward good testimonials.
Address J. S., care of Mr. M'Leod, 18 & 20, Alston Street, GLASGOW.

FOR SALE, for One, Two, or Three years, the surplus TAR and LIQUOR made at the Lichfield Gas-Works.
Particulars on application at the works.

FOR SALE, a 150-light Dry Meter, perfectly new, by one of the best makers. Warranted for six years, and stamped.
Apply to C. R., care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

SLIDE-VALVES.

FOR SALE—14 12-in. and 5 10-in. Slide-VALVES with outside racks. They have been thoroughly re-fitted, and are equal to new. A low price will be accepted to effect a clearance.
Apply to JAMES WATSON, Engineer and Manager, Crystal Palace District Gas Company, LOWER SYDENHAM, S.E.

TO BE SOLD immediately, Gas-Works in good working order and within 10 miles of London, suitable for a mansion, comprising retorts, condenser, washer, purifiers, centre-valve, and gasholder. The above are on a gentleman's estate, and must be cleared off within fourteen days after the sale.
For further particulars apply to Mr. ALFRED LASS, 60, Cornhill, LONDON, E.C.

ON SALE—One 50-ft. by 16-ft. Gasholder, with chains and balance-weights, with 7-in. inlet and outlet pipes, and hydraulic valves all complete. Can be seen working at the Radcliffe and Pilkington Gas-Works, near Manchester.
Any further information with respect thereto may be obtained on application to D. BRANDWOOD, the Company's Manager and Secretary.

TO GAS DIRECTORS IN THE EASTERN COUNTIES.

GAS-WORKS Leased at a rent which will produce from 8 to 10 per cent. dividend on the capital, unless where it is unusually large and the consumption of gas small in proportion.
Apply to EAST ANGLIA, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

COAL Economizing Gas Company, Limited (Skoines's Patent), Earl of Devon, Chairman. OFFERS wanted for fifty £10 shares, £7 10s. paid. Will be sold at a considerable reduction.
Apply to A. Z., care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

TO TAR DISTILLERS.

THE Directors of the Independent Gas-light and Coke Company are prepared to receive TENDERS for the TAR produced at their works, at Haggerston, for One year, from the 31st of July, 1874.
Tenders to be sent to me, on or before Thursday, the 2nd of July, endorsed "Tender for Tar."
The Directors do not bind themselves to accept the highest or any tender.—By order,
JAMES B. COULSON, Secretary.
236, Kingsland Road, June 13, 1874.

TAR AND AMMONIACAL LIQUOR.

THE Directors of the Sutton, Southcoates, and Drypool Gas Company invite TENDERS for the whole of the AMMONIACAL LIQUOR and the surplus TAR made at their Gas-Works, Groves, Hull, from the 1st of July, 1874, to the 30th of June, 1875.
The Directors do not bind themselves to accept the highest or any tender.
Any further particulars may be obtained on application to the Manager.
Tenders to be sent to me, at the Gas-Works, on or before June 26, 1874.
F. W. OLDFIELD, Manager.

TO GAS ENGINEERS AND IRONFOUNDERS.

THE Directors of the St. Helen's Gas Company hereby invite TENDERS for an Annular Condenser, two Scrubbers, Exhauster, and four Purifiers, 16 ft. by 12 ft., with other ironwork.
Drawings and specification can be seen at the Company's Office, St. Helen's.
Sealed tenders to be sent to the undersigned not later than Wednesday, the 24th inst., marked "Tender for Gas Apparatus."
J. ANSDELL, Chairman.

TO METER MAKERS.

THE Directors of the St. Helen's Gas Company are prepared to receive TENDERS for the construction and erection of a STATION-METER, at their works, St. Helen's, Lancashire.
Tenders are required for the following sizes, viz.—to pass 20,000, 25,000, and 30,000 cubic feet per hour.
Specification may be seen at the Company's Office, St. Helen's, or a copy can be obtained on application.
Sealed tenders (for each of the above sizes) to be sent in not later than Wednesday, the 17th inst., addressed to the Chairman, endorsed "Tender for Station-Meter."
The Directors do not bind themselves to accept the lowest or any tender.
WILLIAM PRITCHARD, Manager.
St. Helen's, June 5, 1874.

ENLARGEMENT OF THE ILKESTON GAS-WORKS.

THE Ilkeston Gas Company are desirous to receive TENDERS for the Enlargement of their Works, viz.—
No. 1 Tender. Bricklayer's Work.—To include all work and materials, as described in plans and specifications, for the construction of Gas-Tank, 53 ft. 6 in. by 18 ft., Dry Well, Retort-House, Retort Stack of five arches, a Cottage upon the works, Fence, Walling, &c.
No. 2 Tender.—To include labour and materials for the construction of Gasholder, 52 ft. by 18 ft., with columns, girders, valves, &c.; also Iron Roof to Retort-House, Hydraulic Main, Condensers, &c., and to provide and fix two beds of Clay Retorts, six in each bed, with ascension, H-pipes, &c., as per plans and specifications, which may be seen at the Gas Company's Office, Ilkeston.
Tenders to be delivered at the said Office, directed to the Chairman of the Gas Company, not later than Twelve o'clock, on Monday, June 22 next.
The Directors do not bind themselves to accept any particular tender.—By order of the Directors,
B. WILSON, Secretary.
Ilkeston Gas-Works, June 1, 1874.

NEWPORT AND PILLGWENLLY WATER-WORKS COMPANY.

THE Directors of the above Company are prepared to receive TENDERS for the construction of a large STORE RESERVOIR and other Works, required to contain about 160 million gallons of water, for the Newport and Pillgwenlly Water-Works Company, on their land in the Pant-yr-eos Valley, about 4 miles north-west of Newport, in the parishes of Henllis and Bassaleg, in the county of Monmouth.
The plans and specification may be seen at the Company's Offices, Stow Hill, Newport, or at the Offices of their Engineer, Mr. John Taylor, 27, Great George Street, Westminster; and sealed tenders, in the form attached to the specification, and endorsed "Tender for Pant-yr-eos Reservoir," &c., are to be addressed and delivered to the Directors, at their Offices, Stow Hill, on or before the 29th of June inst.
The Directors do not bind themselves to accept the lowest or any tender.—By order,
CHARLES CULLUM, Secretary.
Newport, Mon., June 10, 1874.

DARLINGTON CORPORATION—GAS DEPARTMENT.

TO BUILDERS, CONTRACTORS, AND ENGINEERS.

THE Darlington Corporation invite TENDERS for the following EXTENSIONS of their works, each contract to be tendered for separately;—
CONTRACT No. 1.—For the Excavation, Puddling, Brickwork, &c., required to be done in the construction of a Gasholder Tank, 102 feet diameter, and 25 feet deep.
CONTRACT No. 2.—For the various works required to be done in the erection of a Retort-House, capable of containing 120 Retorts.
CONTRACT No. 3.—For the construction and erection of Wrought-Iron Roof for the previously named Retort-House.
Drawings, specifications, and conditions of Contract may be seen on and after the 18th inst., on application to Mr. WM. B. EMMERSON, Engineer and Manager, Gas-Works, Darlington, to whom all tenders must be sent, properly endorsed, not later than the 22nd of June next.
The Corporation do not bind themselves to accept the lowest or any tender.
By order,
H. DUNN, Town-Clerk.

TENDERS FOR GAS COAL.

THE Directors of the Tonbridge Gas Company are prepared to receive TENDERS for the supply of 1500 tons of best GAS COAL, to be delivered at their works in the following order:—

200 tons the first week in August next.				
200	,,	,,	Sept.	,,
200	,,	,,	Oct.	,,
300	,,	,,	Nov.	,,
150	,,	,,	Jan.	,,
150	,,	,,	Feb.	,,
150	,,	,,	March	,,
150	,,	,,	June	,,

Tenders to be addressed and sent to the Secretary of the Company at Tonbridge, on or before the 20th of June inst., to state the name and description of the coal, and to be endorsed "Tender for Gas Coal."
The Directors do not bind themselves to accept the lowest or any tender.—By order,
June 5, 1874. JOSEPH SNELLING, Secretary.

TENDERS FOR COAL.

THE Directors of the Bristol United Gaslight Company are desirous of receiving TENDERS for the supply of about 60,000 tons of GAS COALS during the nine months between the 1st day of July, 1874, and the 1st day of April, 1875, to be delivered at their Works, situated at St. Philip's and Canons Marsh, Bristol, or at the Railway Station, Bristol, or f.o.b. at a port of shipment. The quantity to be made up partly of small and partly of large Coal, and to be delivered in such monthly proportions as may be required in accordance with the season.
Parties tendering can do so for the whole or any lesser quantity, and for periods of either one, three, six, or nine months.
The tenders must state the name or description of the pit, and the particular seam from which the Coal is to be supplied, and how much the contractor would undertake to deliver in each month of either small or large Coal.
The contractor to furnish an analysis of the Coal offered, and to deliver the Coals of the accepted tender strictly in accordance with such analysis, and also fresh, of the best quality, and free from sulphur, bats, binds, refuse, and dirt.
The Company to be at liberty to determine the Contract without notice if the Coals are inferior to the quality contracted for.
Payments to be made monthly in accordance only with the weight (20 cwt. to the ton) as weighed upon the weigh-bridges of the Gas Company at their respective stations.
Security for the faithful execution of the Contract to be given if required by the Company.
Tenders to be sent in to the Office of the Gas Company, Canons Marsh, Bristol, on or before Tuesday, the 23rd day of June proximo, addressed under seal to the Secretary, and marked "Tender for Coal."
By order of the Directors,
HENRY H. TOWNSEND, Secretary.
Gaslight Office, Canons Marsh, Bristol, May 29, 1874.

TO IRONFOUNDERS.

THE Widnes Local Board are prepared to receive TENDERS for the supply of about 800 yards of 9-inch Cast-Iron PIPES, with plain sockets. The Pipes are to be coated both inside and outside with Dr. A. Smith's patent black varnish. The price to include delivery free on rails, at Widnes Gas-Works. Further particulars, and a tracing of the Pipes, may be had on application to the undersigned.

Tenders to be addressed to the Chairman of the Gas and Water-Works Committee, endorsed, "Tender for Pipes," and delivered at the Gas-Works, Widnes, not later than the 27th inst.

The Board does not bind itself to accept the lowest or any tender. By order,

T. A. DREW, Engineer and Manager.

Gas-Works, Widnes, June, 1874.

TO GAS-METER MANUFACTURERS.

THE Ramsgate Improvement Commissioners are prepared to receive TENDERS for the supply of 20 WET METERS for Street-Lamps, with 3-light drum-index at top, and modern facilities for adjustment, with iron box and street cover, ready for immediate connexion with service of street-lamps. A guarantee for five years must accompany tender, which must state the price per meter delivered free at Ramsgate.

Tenders, endorsed "Tender for Meters," to be addressed to the Chairman of the Watch and Lighting Committee, by Ten o'clock in the forenoon of the 22nd inst.

E. ELLICE-CLARK, C.E.,
Surveyor to the Commissioners.

Town-Hall, Ramsgate, June 12, 1874.

TO TAR DISTILLERS, &c.

THE Directors of the Kingston-upon-Thames Gas Company are prepared to receive TENDERS for the surplus TAR produced at their works at Kingston, from July 1, 1874, to June 30, 1875. Quantity about 30,000 gallons. Tenders to be at per gallon f.o.b. the Contractor's barge.

Further particulars may be obtained from Mr. Packham, Manager, at the works, where a copy of contract may be seen.

Tenders to be sent to Mr. W. A. Fricker, Secretary, Gas Offices, Church Street, Kingston, on or before the 27th of June inst., endorsed "Tender for Tar."

The Company do not pledge themselves to accept the highest or any tender. By order,

W. A. FRICKER, Secretary.

Gas Offices, Kingston, June 15, 1874.

THE Directors of the Tottenham and Edmonton Gaslight and Coke Company are prepared to receive TENDERS for the TAR produced at their works for One year from the 1st day of July, 1874.

All particulars may be obtained on application to the Secretary.

Tenders, marked "Tender for Tar," must be sent to the Secretary on or before the 26th day of June, 1874.

The Directors do not bind themselves to accept the highest or any tender, and may require security for the performance of the contract. By order,

JAMES RANDALL, Secretary.

Willoughby Lane, Tottenham, June 15, 1874.

ROCHDALE CORPORATION.

TO COLLIERY PROPRIETORS AND OTHERS.

THE Gas Committee invite Tenders for the supply of CANNEL and COAL required during the year ending March 31, 1875. Full particulars may be obtained on application to Mr. Samuel Hunter, at the Gas-Works, Rochdale.

Tenders, endorsed "Tender for Cannel and Coal," must be sent to me not later than Tuesday, the 23rd of June inst.

The Committee do not bind themselves to accept the lowest or any tender.—By order,

ZACH. MELLOR, Town-Clerk.

Town-Hall, Rochdale, June 11, 1874.

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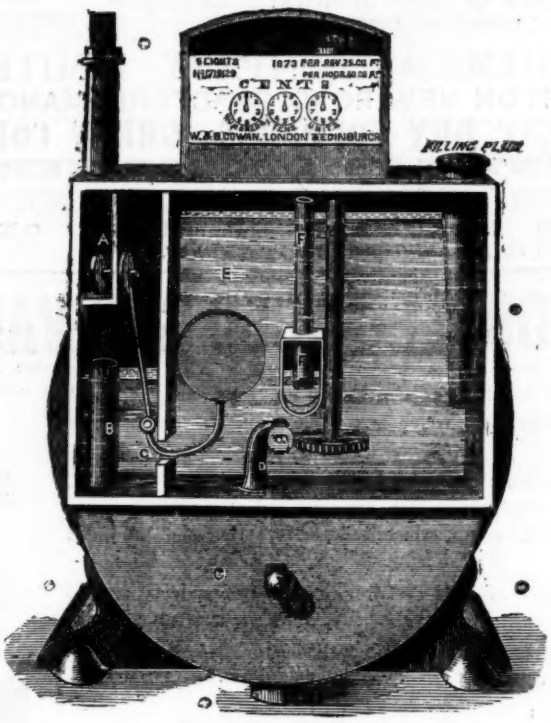

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The gas passes from the valve-box A by the overflow-pipe B into the waste water box C, and upwards through the spout D to the measuring drum; E is the compensating fountain, in which also is the float, the lever of which, passing through the hole G, opens and shuts the valve.

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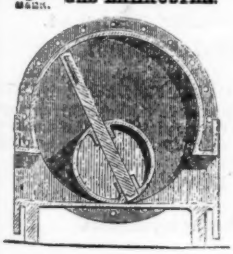

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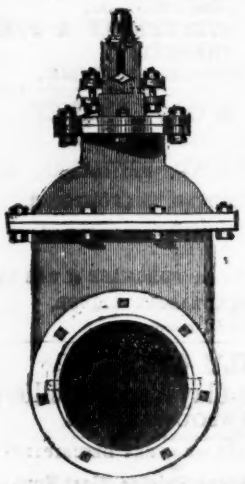


These solidly constructed double-faced Gas-Valves are superseding the old system of the light, single-faced disc, which is too uncertain and unreliable in large bores.

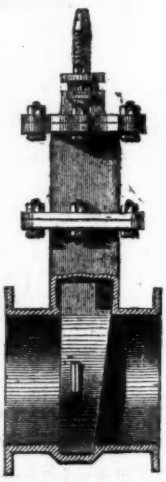
They are guaranteed absolutely gas-tight. They are very massive and rigid, and by improved modes of manufacture they are produced at very little excess in cost over the old light, weak system, which is liable to spring and bend, and become leaky.

The Valve is a rigid wedge of solid cast iron, having two perfectly scraped surfaced facings fitting between the two on the body, which are also surfaced.

A spring in two short halves, and, therefore, not liable to break, is used only for scraping the front facing clean.

The front facing is vertical; the back facing forms the wedge.

At a slight additional expense both flanges are faced to bolt to main-pipes.



GASHOLDERS, TELESCOPE & SINGLE-LIFT, of LARGEST DIMENSIONS.

PURIFIERS, SCRUBBERS, CONDENSERS of most Improved Description.

WOOD SIEVES FOR PURIFIERS,

Which have now been in use for more than ten years, and their advantages and durability fully established. They are made entirely by steam machinery in very large quantities at the most moderate cost.

MIDLAND IRON-WORKS, DONNINGTON, near NEWPORT, SHROPSHIRE; 8, FINSBURY CIRCUS, LONDON.

THE ECONOMIC GAS-RANGE & ROASTER COMPANY,

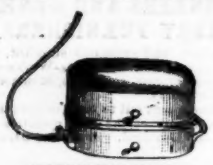
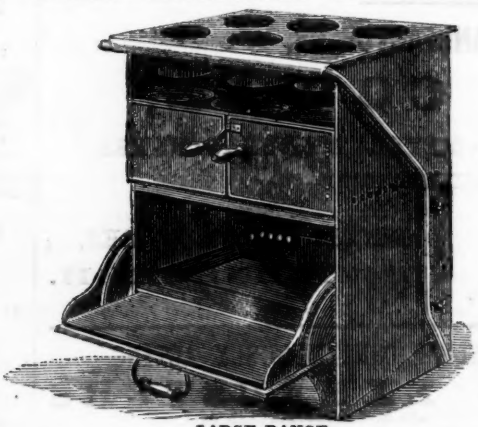
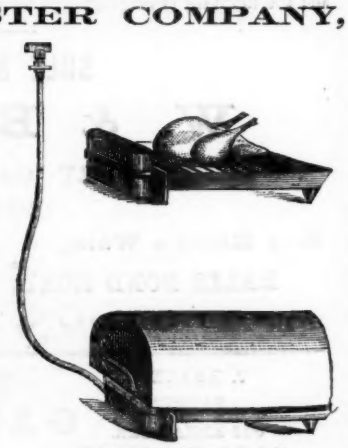


TABLE ROASTER.

SMALL RANGE.



LARGE RANGE.



ROASTERS, Nos. 1, 2, & 3.

ON SOUTHBY'S PATENT, WHICH SECURES PERFECT VENTILATION.

A 7-lb. JOINT ROASTED TO PERFECTION FOR ONE HALFPENNY.

SELECTED BY THE COMMISSIONERS FOR THE ANNUAL INTERNATIONAL EXHIBITIONS, 1871 & 1873.

A pennyworth of gas, perfectly consumed and economized as it is under this Patent, does as much work as six pennyworth of coal. The peculiar arrangement of cannel fishtails in a chimney secures freedom from smoke even with the richest gas, and a positive immunity from every trace of smell. The simplicity in use is so great that no experience is required. Roasters from 12s. 6d. to £1 5s. Complete Ranges at £2 4s. for small families; £3 10s. for ordinary establishments; and £6 6s. for a Range equal in power to a large Kitchener. Estimates given for fitting up Hotels, Restaurants, and large Establishments.

Works: 2, BASSETT STREET, MALDON ROAD, KENTISH TOWN, N.W.,

Where the Apparatus can be seen in operation;

And at Mr. WOODCOCK'S Offices, 23, ABINGDON STREET, WESTMINSTER, where Mr. SOUTHBY can be consulted by appointment.

ALDER AND MACKAY,

GRANGE WORKS, EDINBURGH,

MANUFACTURERS OF

CONSUMERS IMPROVED GAS-METERS;

IMPROVED DRY GAS-METERS, in Cast Iron and Tin Cases,

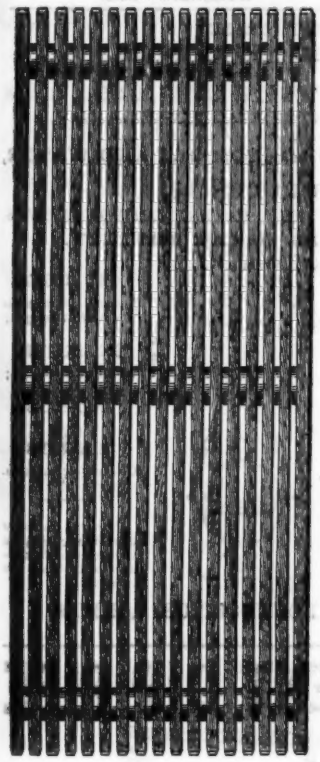
OF THE HIGHEST EXCELLENCE,

Warranted to measure correctly, and not to vary.

STATION METERS AND GOVERNORS,

EXPERIMENTAL METERS, PHOTOMETERS, GASHOLDERS, &c.

PLAN AND SECTION OF WOOD GRID, FOR PURIFIERS.



TAPER BAR, TURNED BLOCK.
SCALE 1½ INCH = 1 FOOT.

PROUD'S

SPECIALITIES in WOOD

FOR

PURIFIERS AND SCRUBBERS

FOR SCRUBBERS,

GRIDS OF PITCH PINE,

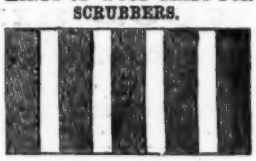
STRONGLY RECOMMENDED.

BROOKFIELD WORKS,

103, ICKNIELD STREET EAST

BIRMINGHAM.

VERTICAL SECTIONS OF THREE KINDS OF WOOD GRIDS FOR SCRUBBERS.



SCALE, ONE-FOURTH FULL SIZE.

Established

1795.

JOSEPH CLIFF & SON,

THE ORIGINAL

WORTLEY FIRE-BRICK WORKS,

NEAR LEEDS,

MANUFACTURERS OF ALL DESCRIPTIONS OF

FIRE GOODS, and Salt-Glazed Drain-Pipes.

LONDON WHARF:

Wharf No. 4, inside Great Northern Goods Station, King's Cross, N.;

LIVERPOOL—1, Back Leeds Street,

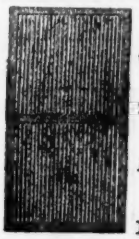
Where is always kept a Stock of Retorts, Fire-Bricks, Terra Cotta Ware, and Drain-Pipes.

CLAYTON'S PATENT SIX-WAY VALVE only requires one valve to work two purifiers; saves more than three-fourths of the connexion-pipes; requires neither tees, elbows, nor bends; no racks or springs to get out of order.
For particulars, apply to CLAYTON, SON, & Co., Gas Engineers, Hunslet, LEEDS.

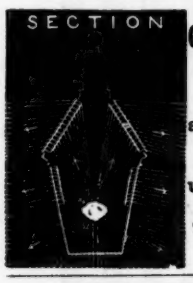
THOMAS CARR & SON,
MANUFACTURERS OF
FIRE-BRICKS, LUMPS, TILES, RETORTS, &c., &c.,
SCOTSWOOD FIRE-BRICK WORKS,
NEAR
BLAYDON-ON-TYNE.

TO GAS COMPANIES, ENGINEERS, &c.
WOOD SIEVES.—WOOD SIEVES.
Estimates given and Contracts taken by the Manufacturer
GEORGE MACKANESS,
36, EDWARD STREET, HAMPSTEAD ROAD,
LONDON, N.W.
These Sieves are made with parallel or bevel bar, and guaranteed to be well seasoned yellow deal, and not common spruce so generally used.
N.B.—Specimens sent free on application.

B. CARPENTER,
THE ORIGINAL MANUFACTURER OF
WOOD SIEVES
FOR
GAS PURIFIERS & SCRUBBERS.
WORKS:
22, HERMES STREET, PENTONVILLE ROAD,
LONDON, N.



DEMPSTER'S
RENOWNED
WOOD SIEVES,
WITH TAPER BARS,
MADE BY MACHINERY
CAPABLE OF MAKING 10,000 FEET WEEKLY.
References to Hundreds of First-Class Engineers.
ROSE MOUNT IRON-WORKS
ELLAND, NEAR HALIFAX.



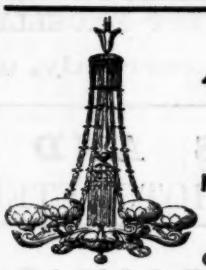
THE PATENT
CATOPTRIC LAMP
Is now in use in Moorgate Street, Cheapside, and Trafalgar Square, and has been in successful operation upon Waterloo Bridge since Oct. 7, 1871.
T. A. SKELTON, 37, Essex St., Strand, LONDON,
INVENTOR AND PATENTEE.

GAS AND WATER PIPES.
WILLIAM MACLEOD & CO.,
18 & 20, ALSTON STREET, GLASGOW.
CAST-IRON GAS AND WATER PIPES.
MALLEABLE IRON TUBE FOR GAS, WATER, AND STEAM.
AGENTS FOR THOMAS GLOVER & CO.'S
PATENT DRY GAS-METERS.
DELIVERY F.O.B. ON CLYDE.
Lists on application.

THE EARL OF HUME'S
LESMAHAGOW
MAIN SEAM CANNEL COAL.
CRAIGNETHAN GAS COAL CO.,
LESMAHAGOW, N.B.
Analysis and Price on Application.

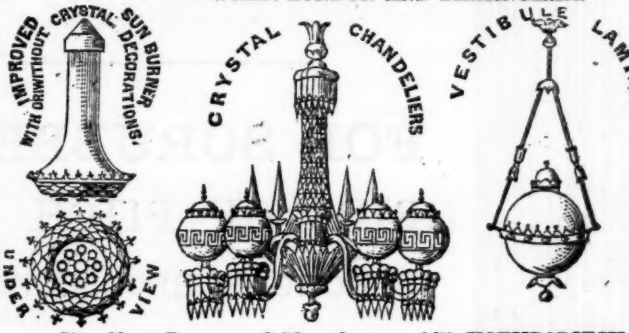
THE
WIGAN COAL & IRON COMPANY,
LIMITED,
COLLIERY PROPRIETORS,
(Head Offices: WIGAN, LANCASHIRE;
District Office: 18, BENNETT'S HILL, NEW STREET, BIRMINGHAM,)
Supply the Best Wigan Arley Mine Gas Coal and Nuts; the Best Hand-picked Round Cannel;
ALSO SMALL OR GAS CANNEL, &c., &c.

ALFRED WILLIAMS,
PHŒNIX FIRE-BRICK WHARF,
64, BANKSIDE, SOUTHWARK, LONDON, S.E.
GAS ENGINEER AND CONTRACTOR FOR THE ERECTION OF GAS-WORKS,
AND FOR THE
SUPPLY OF RETORTS, FIRE-BRICKS, CAST-IRON MAINS,
AND ALL MATERIALS FOR GAS MANUFACTURE AND DISTRIBUTION.



F. & C. OSLER,
45, OXFORD STREET, LONDON, W.
MANUFACTORY AND SHOW-ROOMS:
BROAD STREET, BIRMINGHAM.
ESTABLISHED 1807.
MANUFACTURERS OF CRYSTAL GLASS CHANDELIERS
WALL LIGHTS, AND LUSTRES FOR GAS AND CANDLES.
TABLE GLASS OF ALL KINDS.
CHANDELIERS IN BRONZE AND ORMOLU. MODERATOR LAMPS.

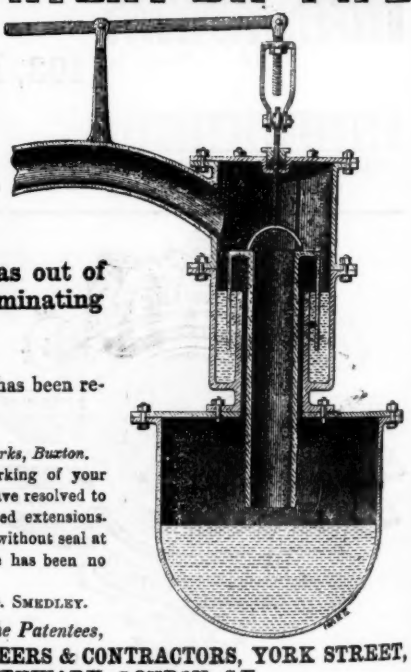
TO GAS COMPANIES AND THE TRADE.
J. DEFRIES & SONS,
MANUFACTURERS OF
CRYSTAL, BRONZED, & ORMOLU CHANDELIERS, IMPROVED CRYSTAL STAR & SUN LIGHTS, VESTIBULE LAMPS, AND THE PATENT CRYSTAL ILLUMINATION.
A LARGE STOCK ALWAYS IN HAND OF
IRON, BRASS, COMPOSITE, AND LEAD TUBES, FOR GAS AND WATER,
AND EVERY DESCRIPTION OF
GAS AND WATER FITTINGS.
THE PATENT DRY AND WET METER, WITH THE LATEST IMPROVEMENTS.
STREET LAMPS AND COLUMNS IN GREAT VARIETY.
WORKS: LONDON AND BIRMINGHAM.



GAS MOONS, Cut and Engraved, of the newest designs;
GAS REFLECTORS In Silver and Glass;
GAS NIBS AND **BURNERS** Of every description.
Pattern-Books of Gas-Fittings, Crystal and Ormolu Chandeliers for 1873, are now complete.

City Show-Rooms and Manufactory, 147, HOUNDSDITCH, LONDON.
ESTABLISHED 1830.

CHANDLER'S PATENT DIP-PIPE



The advantages are—
1st, There is no pressure on the Retorts.
2nd, No deposit of Carbon.
3rd, No scurfing required.
4th, Never a choked Ascension Pipe.
5th, Saves Fuel and Wear and Tear.
6th, Gets 10 per cent. more Gas out of the Coal, and a higher Illuminating Power.
7th, Is never out of order.

The following (among other letters) has been received:—

Messrs. Chandler and Sons.
Manager's Office, Gas-Works, Buxton.

Gentlemen,—I am so satisfied with the working of your Patent Dips during the last five months that I have resolved to recommend the adoption of them in our proposed extensions. I find it under perfect control to work with or without seal at pleasure, and that during the whole time there has been no deposit of carbon.—Yours, &c.,
Jan. 21, 1874. GEO. SMEDLEY.

For terms of use and cost, apply only to the Patentees,
Messrs. CHANDLER & SONS, ENGINEERS & CONTRACTORS, YORK STREET, LONDON ROAD, SOUTHWARK, LONDON, S.E.

J. & J. BRADDOCK,

GAS ENGINEERS,

GLOBE METER-WORKS, OLDHAM,

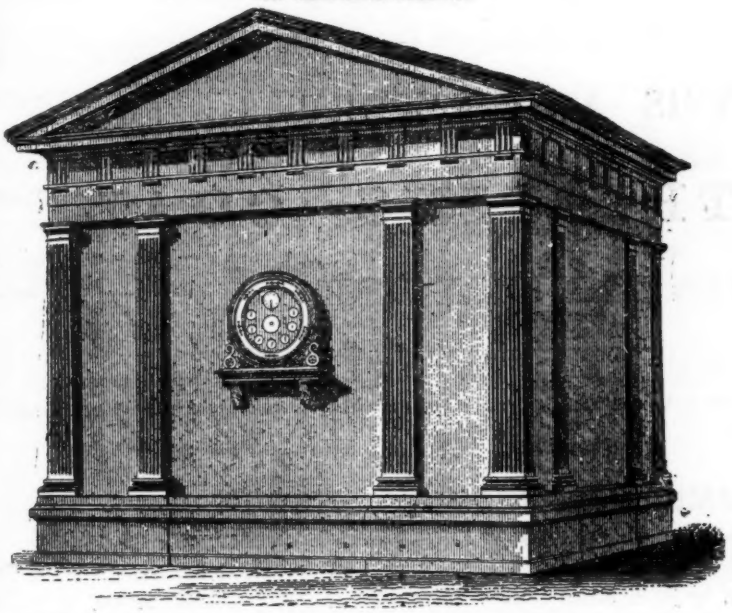
MANUFACTURERS OF

WET & DRY CONSUMERS GAS-METERS

OF THE HIGHEST EXCELLENCE;

ROUND STATION-METERS,

ON CAST-IRON STANDS.



SQUARE STATION-METERS,

WITH PLANED JOINTS.

GOVERNORS, GAUGES, INDICATORS, MAIN COCKS, &c.

GAS COOKING APPARATUS.

WATER-METERS SUITABLE FOR ALL PRESSURES.

Home and Foreign Orders promptly attended to.

All Sizes of CONSUMERS METERS, STATION-METERS, and GOVERNORS generally in Stock.

Orders almost invariably despatched on the day of receipt.

TERMS, &c., ON APPLICATION.

JAMES MILNE & SON,

GAS ENGINEERS,

Gas-Meter, Gas Apparatus, and Gas-Fittings Manufacturers,

EDINBURGH, AND

2, KING EDWARD STREET,

NEWGATE STREET, LONDON.

STATION-METERS, GOVERNORS, CONSUMERS METERS, GAS LUSTRES, CHANDELIERS, BRACKETS, &c.,

And every description of Gas-Fittings and Gas Apparatus.

CANNEL COAL.

ELLIS LEVER & CO.,

GAS COAL MERCHANTS,

107, PICCADILLY, MANCHESTER.

ALL CLASSES OF

ENGLISH, SCOTCH, & WELSH CANNEL COALS.

CANNEL COAL.

COPPA COLLIERY, MOLD,

Beg leave to call the attention of Gas Companies to the superior quality of their

CANNEL FOR GAS-MAKING PURPOSES.

This Cannel produces in actual working, in iron retorts, 9200 cubic feet of 32-candle gas, and upwards of 11 cwt. of coke, and in clay retorts will produce 11,500 cubic feet of 25·9-candle gas.

Ports of shipment—Birkenhead or Connah's Quay.

Waggons supplied for delivery by railway to any part of England or Wales.

For particulars, prices, and rates of freight, apply to The Coppa Colliery, Mold, Flintshire.

THE

HUCKNALL COLLIERY COMPANY

Can offer a CANNEL COAL yielding a large quantity of Gas of superior quality.

Prices and information on application to the Hucknall Colliery Company, Hucknall Torkard Collieries, near Nottingham.

POPE & PEARSON'S GAS COAL.—We have now the authority of several of the most eminent Gas Engineers of London in stating that our Coal yields *in practical working over 10,000 cubic feet of gas, with an illuminating power of 16 candles;* or by the standard burners now used by the London Gas Companies, an illuminating power equal to 17½ candles.

One ton yields 12½ cwt. of good coke. This Coal can be shipped from Hull, Goole, Liverpool, Morecambe, and Barrow.

For further particulars, apply to Pope and Pearson, West Riding and Silkstone Collieries, near Leeds.

SCOTCH CANNEL COALS.

The Subscriber is prepared to contract for the supply of all the principal Scotch Cannel Coals. Prices and Analyses of the various Coals will be forwarded on application.

JAMES M'KELVIE,

CANNEL COAL MERCHANT,

HAYMARKET, EDINBURGH.

Established 1840.

THE MIDLAND COAL COMPANY

Are prepared to enter into CONTRACTS with

CORPORATIONS & GAS COMPANIES

FOR SUPPLIES OF

GAS COAL & CANNEL.

Prices, Analysis, and other information on application at the

MIDLAND COAL OFFICES,

118a, OXFORD STREET, MANCHESTER.

OMOA GAS COAL.

THE OMOA AND CLELAND IRON AND COAL COMPANY, LIMITED,

ARE NOW IN A POSITION TO

SUPPLY FROM THEIR PITS AT OMOA

GAS COAL

OF A VERY SUPERIOR QUALITY.

This Coal, according to the report of the analyst, yields 11,119 cubic feet of gas per ton, and has an illuminating power of 33·97 candles per 5 cubic feet per hour.

Copies of the analysis and full particulars as to price, &c., may be had on application to the Secretary of the Company, 172, West George Street, Glasgow.

EVERY DESCRIPTION

OF

GAS COAL AND CANNEL

SUPPLIED BY

E. FOSTER & CO.,

COAL and CANNEL

MERCHANTS,

21, JOHN STREET, ADELPHI,

LONDON, W.C.

Prices Quoted on application.

LEE and JERDEIN,

COAL OWNERS & MERCHANTS.

Chief Office:

9, LANCASTER PLACE, STRAND, LONDON, W.C.

SOLE VENDORS FOR

LONDON & THE SOUTHERN COUNTIES

OF

WIGAN COAL AND CANNEL,

From the Mines of the

INCE HALL COAL & CANNEL COMPANY, Limited,

AND

Messrs. W. H. BRANCKER & Co.

WILSONTOWN GAS COAL.

This Coal bears a close resemblance to the Lesmahago seam. It has a first-class Coke, equal to the Lesmahago, and greater in quantity, and 10,538 Cubic Feet of 33·2 Candle Gas.

For rail in Scotland, or shipped at Glasgow, Leith, or Granton.

ANALYSIS AND REPORT

ON

CLIMPY TRIPPING COAL,

FOR GAS PURPOSES.

The results of this analysis, as shown below, were got from actual working, and we have therefore the utmost confidence in placing it, along with that annexed, before you.

COMMERCIAL RESULTS.

Gas per ton of Coal—temperature 60°—barometer 30 inches	10,200 cubic feet.
Coke per ton of Coal	1,400 lbs.
Durability of one cubic foot of the gas, by jet of 5-inch flame	48 min. 24 sec.
Illuminating power in standard candles	14·9

REMARKS.

Being well acquainted with Durham and Northumberland Coals, I have no hesitation in saying that "CLIMPY TRIPPING" is superior to any (containing, besides, a greater proportion of pieces from 7 to 14 lbs. weight), with far less impurities for purification, more gas, and coke equal in calorific power. It has a large mixture of cannel nuts, which accounts for the good quality of the gas, at our photometer in town, 1000 yards from the works.

It is also a very superior Coal for mixing with oils, as by Mackenzie's patent; or with acid tar, or tar oil, shale grease, or other refuse from paraffin-works, as by system of Mr. Scott, of Musselburgh, or Mr. Foster, Portobello, the Coal being easily crushed.

Below are the results realized by myself, when mixed with acid tar from paraffin work, received by me in a solid state, having been run on to very fine dross. My charges were 2 cwt. tripping and 28 lbs. of acid tar, each retort, running six hours; with lighter charges I get more gas, but not so good quality, or so much coke.

Gas per ton of Coal	10,800 cubic feet.
Coke per ton of Coal	1,540 lbs.
Durability of one cubic foot of gas, by jet of 5-inch flame	58 min. 28 sec.
Illuminating power in standard candles	27·29

The first truck received being tried with very light charges (unmixed), and running five hours, I got 10,500 cubic feet of 14-candle gas; and I am confident, practical managers, with good retort-fittings (mine being very inferior), and exhausters at work, as I have seen generally at home and abroad, will take 11,000 feet of 13-candle gas from it. My retorts are 8 feet × 2 feet × 14 inches, D shape, heavy dip, and no exhauster.

These remarks of mine you may perhaps think rather lengthy, but they will be the more intelligible to any manager inquiring for Climpy Tripping.

L. MONK,
Engineer and Manager.

Lanark Gas-Works, April 20, 1874.

GRAY AND PAUL,

WILSONTOWN GAS COAL WORKS & CLIMPY COLLIERY,

BY CARNWATH, N.B.

G. J. EVESON,

GAS COAL MERCHANT,

STOURBRIDGE.

Delivery per Rail to any Part.

ROBERT MARSHALL,
CANNEL COAL MERCHANT,
173, ST. VINCENT STREET, GLASGOW.

RUSSEL'S BOGHEAD.

MUIRKIRK, No. 1, CANNEL
Yields 11,600 cubic feet of 34·3-candle gas per ton, and 10 cwts. of excellent coke, containing only 5 per cent. of ash.

MUIRKIRK, No. 2, CANNEL
Yields 10,700 cubic feet of 32·77-candle gas per ton, and 9½ cwts. of coke, containing 11 per cent. of ash.

OLD WEMYSS CANNEL
Yields 12,550 cubic feet of 33-candle gas per ton.
Prices and full Analyses on application.

ALBERT GAS COAL.

THE DERBYSHIRE
SILKSTONE COAL COMPANY,
LIMITED,
CAN OFFER A
GAS COAL
Of superior quality, delivered at any station in England and Wales.

Purified gas per ton of coal in cubic feet (average)	10,775
Weight of coke in lbs. per ton of coal	1,465

ANALYSIS AND PRICES ON APPLICATION TO
Mr. EDMUND TAYLOR, Secretary,
ALBERT COLLIERY, NEWBOLD, NEAR CHESTERFIELD.

DUKINFIELD CANNEL COAL.

THE DUNKIRK COAL COMPANY.

OFFICES:
ASTLEY DEEP PIT, DUKINFIELD.

ANALYSIS, PRICES, AND OTHER INFORMATION, ON APPLICATION AT THE ABOVE OFFICES.

MESSRS. NEWTON, CHAMBERS, & CO.,
THORNCLIFFE IRON-WORKS AND COLLIERIES,
NEAR SHEFFIELD,
STRONGLY RECOMMEND A TRIAL OF THEIR
CELEBRATED SILKSTONE GAS NUTS.

Analysis by F. J. EVANS, Esq., Chartered Gas Company, Horseferry Road, Westminster:—

(COPY.)

	Cubic Feet of Gas per Ton of Coal.	Illuminating Power in Candles.	Coke per Ton of Coal used.	Ash in Coke, per Cent.	Sulphur in Coal, per Cent.
Silkstone Nuts . . .	10·800	15·85	12·66 cwt.....	6·0	0·69

NOTE.—The illuminating power of the gas was tested by the standard burner now used in London by the Gas Referees, under the City of London Gas Act, 1868.

Horseferry Road, Westminster, March, 1870. (Signed) F. J. EVANS.

These Nuts are extensively used by various Gas Companies throughout the Kingdom, who bear strong testimony to their value.

APPLICATIONS FOR PRICES, &c., TO BE SENT DIRECT TO THE COLLIERY, AS ABOVE.

CROLL'S
DRY GAS-METERS,

PRIZE MEDALS. (INVENTED & PATENTED IN 1844,) PRIZE MEDALS.

LONDON, 1851; NEW YORK, 1853 PARIS, 1855. COMBINING ALL THE LATEST IMPROVEMENTS, LONDON, 1862; DUBLIN, 1865 PARIS, 1867.

MANUFACTURED ONLY BY

THE GAS-METER COMPANY, LIMITED,

238, KINGSLAND ROAD, LONDON, N.E.

ALEXANDER WRIGHT & CO.,

MANUFACTURERS OF

"WET" & "DRY" GAS-METERS

of the highest excellence.

STATION-METERS AND GOVERNORS.

STREET-LAMP REGULATORS.

TESTING APPARATUS

of the most perfect description for all purposes relating to Gas.

NOW READY.

"GAS MEASUREMENT AND GAS-METER TESTING," by F. W. HARTLEY, A. Inst. C.E.
Third Edition, cloth boards, 2s.; per post, 2s. 2d.

55 and 55A, MILLBANK STREET, WESTMINSTER, S.W.

R. LAIDLAW AND SON,

EDINBURGH AND **GLASGOW.**

Manufacturers of

CONSUMERS IMPROVED WET GAS-METERS,

THE UNVARYING WATER-LINE GAS-METERS,

IMPROVED DRY GAS-METERS, in Cast-Iron or Tin-Plate Cases;

STATION-METERS, ALL SIZES, up to 15 feet Square, with PLANED JOINTS;

Experimental Meters, Photometers, Pressure-Gauges,
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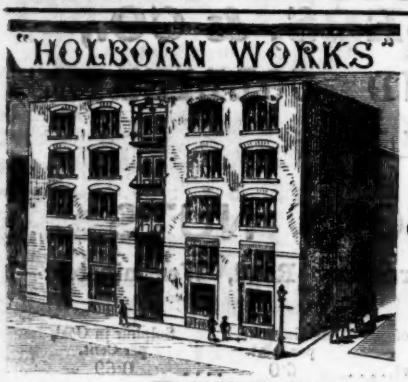

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